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THE AUTOMOBILE

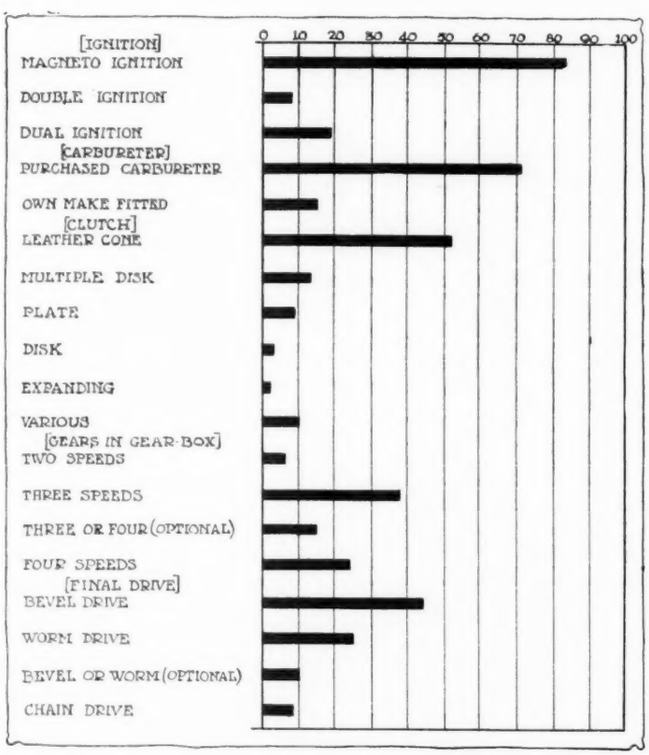
Olympia—Small Car Triumph

Six-Cylinder Cars no Longer Increasing in Popularity—European Makers Concentrating on Fewer Models—Spring Suspension Is Improving

By J. S. Critchley, President I.A.E.

LONDON, ENG., Nov. 14—*Special to* THE AUTOMOBILE — Once more Olympia has demonstrated to the world that the automobile industry of Europe is progressing rapidly, yet with a normal and healthy growth that is indicative of the conservatism of the European manufacturer and at the same time illustrative of the spirit of progress. Nowhere can the tendency of European design be studied as well as at this great annual show and it is with the keenest interest that the American manufacturer looks to Olympia to see what the skilled hand of Europe has produced.

Tendencies of design there are, yet the most diligent study will fail to show anything of a radical departure from what has become standardized practice. The skill of the coach builder and the creations he has produced to meet the fashions of the day are the high lights of the show and this work stands out brilliantly against the solid background of standardized mechanical design. One other feature of the show which illustrates the growing interest in automobiling on the part of those who could not afford the expensive coach work is the small car. There are many of these and they indicate that competition with the American low-priced car is becoming keener.



¶*The above chart shows the tendency as exhibited at Olympia. Magneto ignition alone without the use of a supplementary battery is employed on more than 80 per cent. of the cars. More than 70 per cent. of the European manufacturers are purchasing carbureters from specialists in this field. The leather-cone clutch is used on more than half the cars and worm drive is rapidly gaining on the bevel gear, the worm-drive now equalling it.*

One cannot but be struck by the difference of opinion on the other side of the water and in America on the six-cylinder car. In America the list of sixes grows day by day and many of the successful firms have found it profitable to exclude the four-cylinder from their output altogether. At Olympia evidence can be found on every hand that the six is waning in popularity and that the curve of increase in numbers of the six is about to start on the decline.

In marked contrast to this is the small car. On every side is to be seen either a new small model produced by an old manufacturer or the work of a new company which has entered the small car field. These cars are not of the cyclecar class but rather what might be called

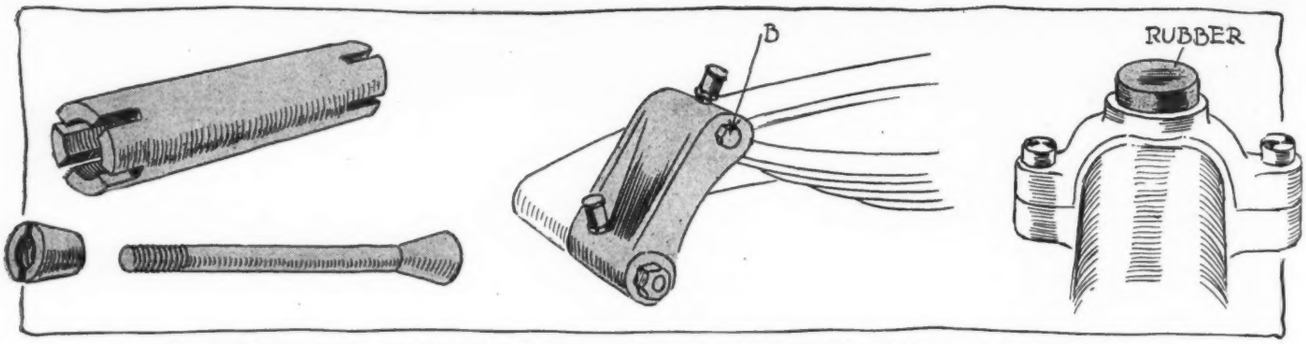


Fig. 1—Cacchi engine gudgeon pin—Vauxhall rear spring shackle—Rubber buffer on Delaunay axle

miniature automobiles. These small cars are for the most part four-cylinder types, the two-cylinder car not seeming to meet the popular fancy. Some of the companies in this field, however, offer a two-cylinder design in the very small horsepowers. This is true of Swift, for instance, who produces two four-cylinder designs and a two-cylinder, the highest horsepower being 16.

Small Car Popular

The 16-horsepower car is the most popular in England and on the continent. Many companies are concentrating on a single model of this size. In fact, the companies that have added a model to their line have made it very close to this size in a very large number of instances. The Daimler company, for example, has added a 20, bringing their number of models up to four. Armstrong has added a new 20 and Straker-Squire continues to concentrate on the 15-20.

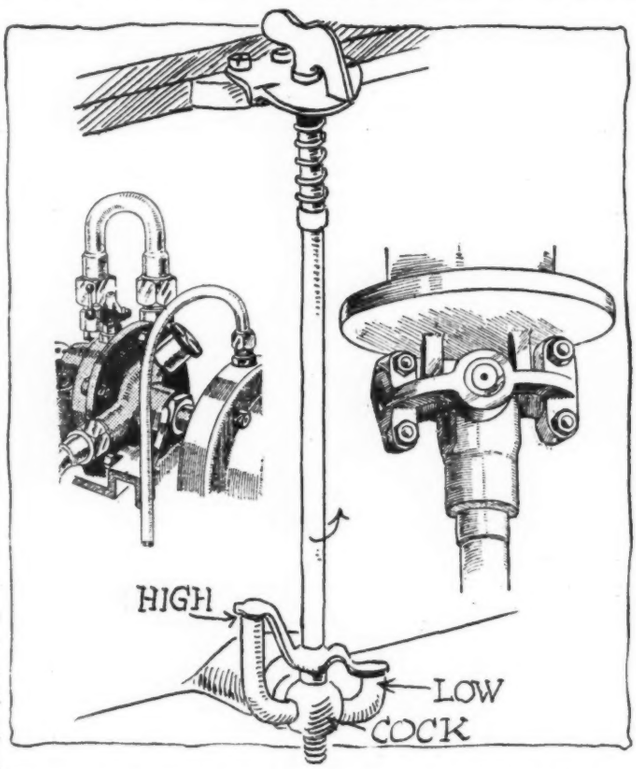


Fig 2—Left, G. W. K. pump. Center, Benz oil level. Right, Belsize universal

These companies are representative of general English practice at present. In fact, many have at last realized the point that numerous models and frequent changes are not consistent with the low cost of production demanded by the present selling prices.

Minor Features Improved

In studying the tendencies of design one must delve more deeply into minor features this year than ever before, but there are some methods of ignition, cooling, etc., that seem to be gaining in popularity. Single ignition for which the current is furnished by magneto alone and with no auxiliary battery is used on more than 80 per cent. of European cars. Dual ignition is used on about 16 per cent. and double ignition on about 4 per cent. At first one might suppose that the popularity of single magneto ignition was due to the fact that the starter was coming in vogue and that the cranking speed was so great

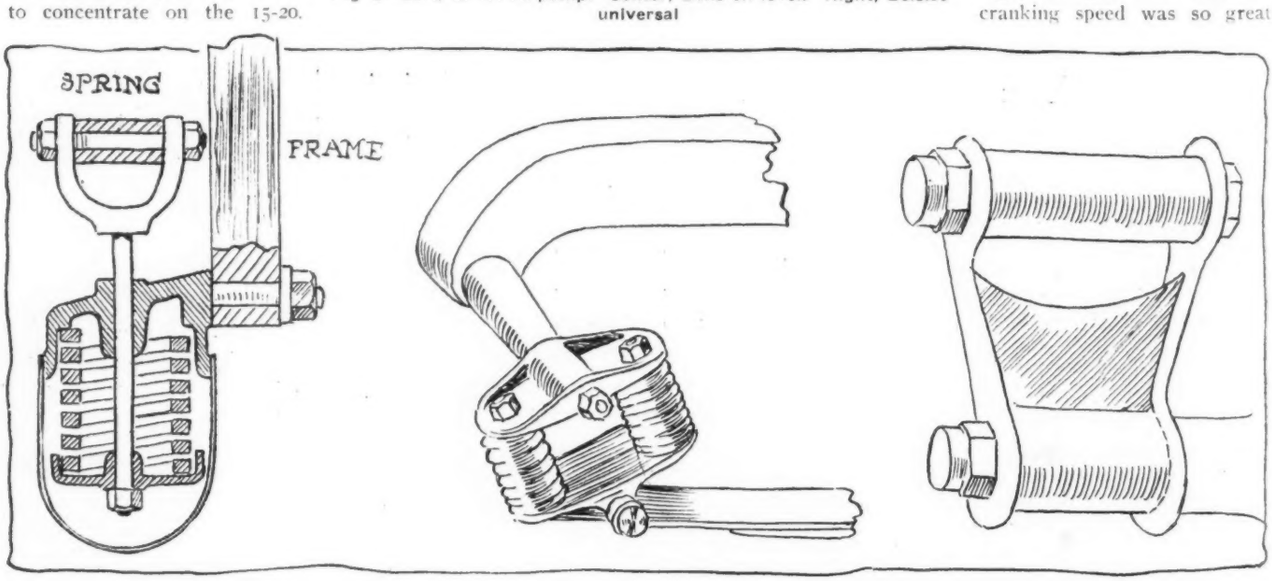


Fig. 3—Singer supplementary spring—Standard supplementary spring—Lorraine-Dietrich webbed shackle

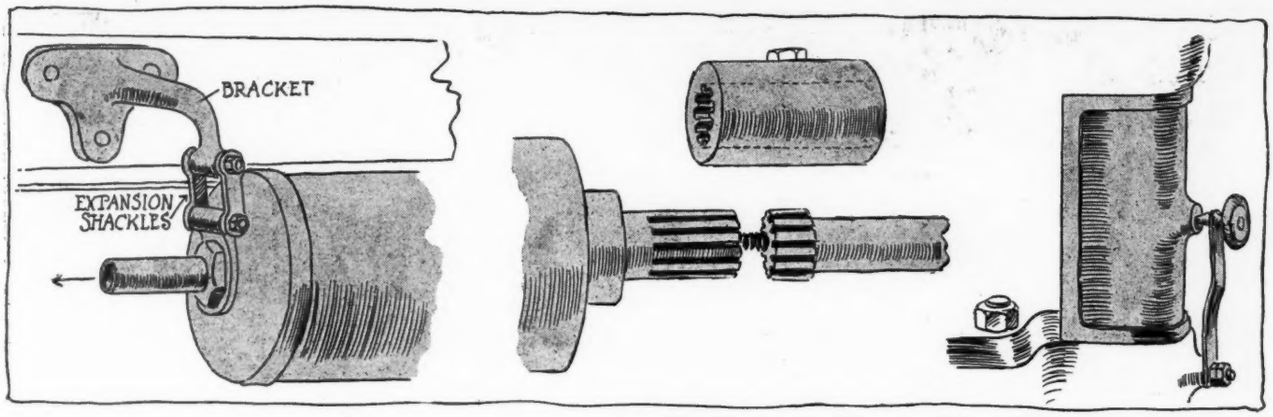


Fig. 4—Leon Bottée muffler bracket—Standard flexible joint—Austin valve spring cover

that the battery ignition for starting was unnecessary. This, however, is not the case, as at the show less than ten makes of cars are to be seen fitted with starters. It speaks well, though, for the accepted reliability of the magneto.

Outside Carbureters Fitted

Whereas it used to be common practice for the European maker to design a carbureter of his own, the carbureter of the specialist in this design has come to be depended upon to a large extent. In fact, 71 per cent. of the cars shown at Olympia are fitted with carbureters purchased outside. Others offer optional makes and about 15 per cent. are showing cars equipped with carbureters manufactured by the same company as the cars themselves.

It has often been stated the clutch of Europe is the disk type. Statistics gathered at the show, however, do not bear out this point, as 51 per cent. of those shown are of the leather cone type, while the multiple-disk is represented by 15 per cent. The expanding band clutch is used on but 2 per cent. of the cars shown and the disk type on but 4 per cent. Many of the engineers present at the show have predicted an increase in popularity for the disk type in which a single disk of steel is gripped between two plates faced with some asbestos woven material.

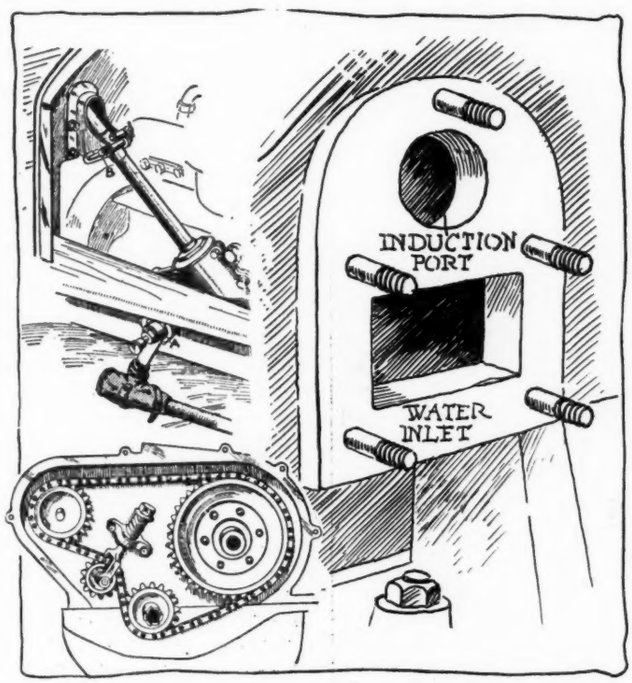


Fig. 2—Left, Napier steering column. Right, Rover carbureter facing. Lower, Belsize camshaft drive. These features are indicative of the attention to detail which is a feature at the show

Four Speeds Popular

While it is not true that the four-speed gearset outnumbers the three-speed, there is not a wide difference. The three-speed gearbox is found on 39 per cent. of the makes shown at Olympia, while the four-speed gearbox is shown on 25 per cent. Fifteen per cent. are offering a choice of either the three or four-speed gearbox and with the later taken into consideration it is found that

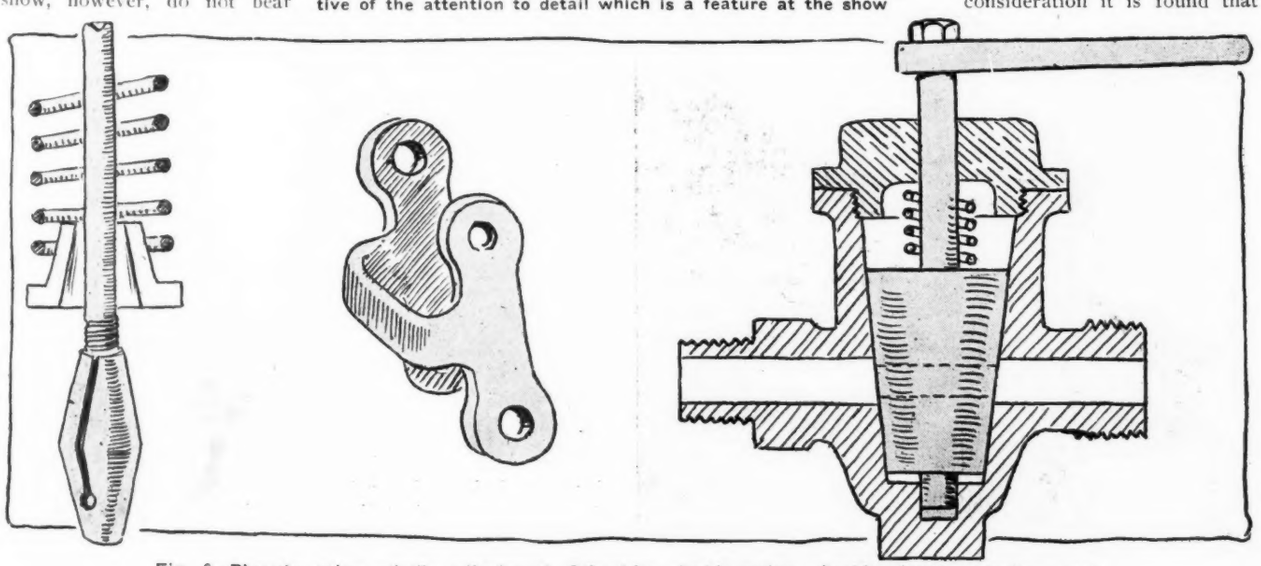


Fig. 6—Phoenix valve spindle adjustment—Schneider double-spring shackle—Austin gasoline cock

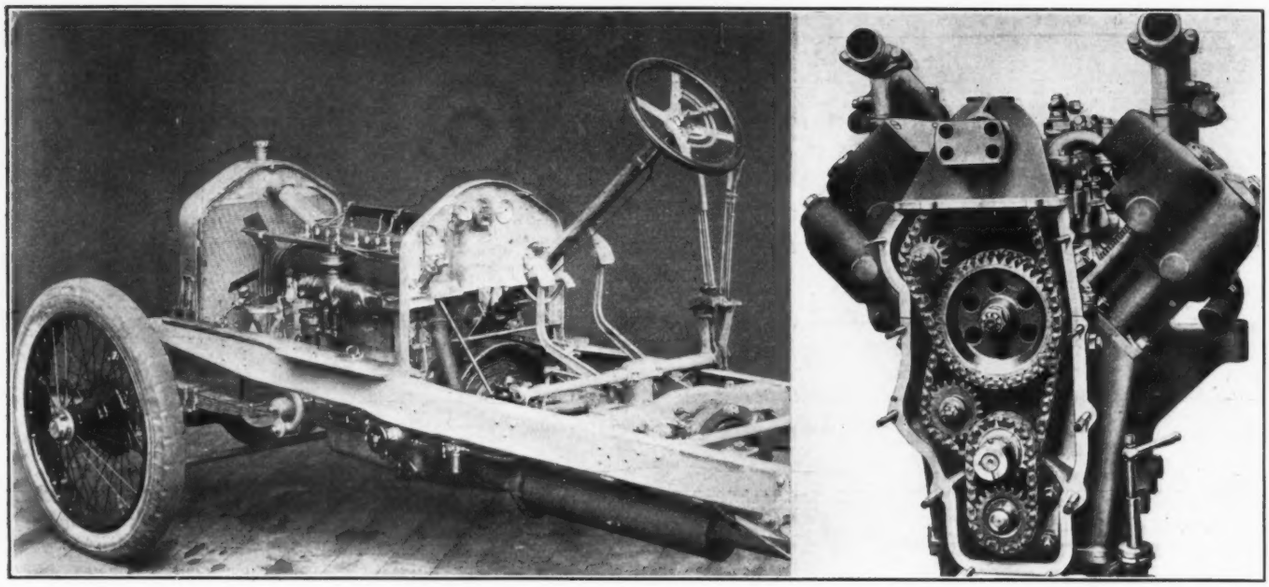


Fig. 7—Forward end of Wolseley 24-30 horsepower chassis—Chain-driven gear case of 8-cylinder DeDion

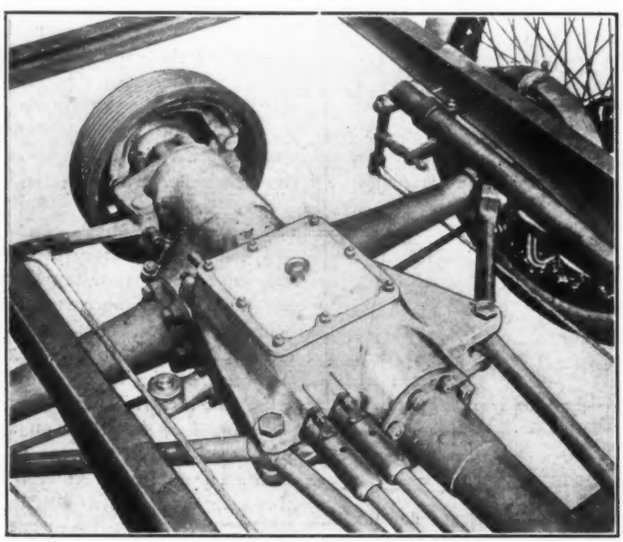


Fig. 8—Rear axle of new Daimler 20, showing brake

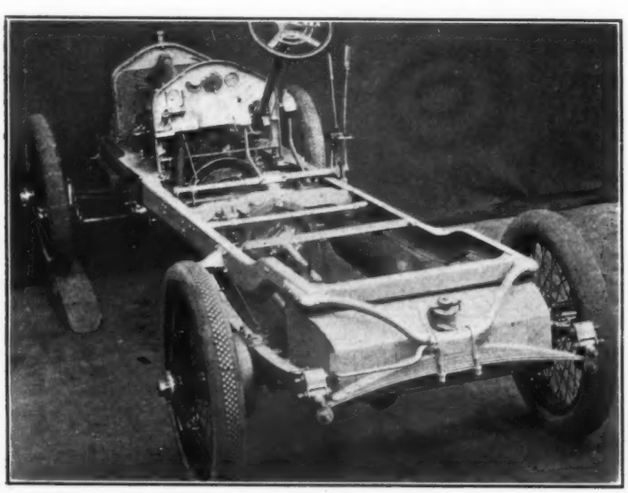


Fig. 9—Chassis of 30-40 horsepower Wolseley for 1914

the numbers very closely equal each other. One of the features of European design is the use of a four-speed gearbox on the smaller and lighter weight cars, and it is in this peculiarity that one of the differences in cheap-car design in Europe and America may be seen. The American cheap car has a high power motor and a three-speed gearbox. The European cheap car, on the other hand, uses a motor rated at about one half the horsepower and flexibility is secured by the use of the four speed changes. From this it is not to be imagined that the European travels slowly and is content with an underpowered car. The reason lies in the fact that road conditions on the average are better and the high power is not so necessary to maintain the speeds and any poor road conditions can be taken care of by the four speed changes. As far as speed goes the European requires a high running average and a car that will stand up under the stresses of high speed through long continuous runs. It is this condition which has given rise to the view that to be successful in Europe the American automobile manufacturer must design a car with a small high speed motor capable of giving long wear and securing flexibility through a four-speed gearbox.

Europe Likes Worm Drive

Olympia has once more shown that Europe likes the worm drive. No less than 25 per cent. of the cars exhibited are driven in this manner, while 45 per cent. use the bevel gears. Ten per cent. offer a choice of bevel or worm and the fact that in most instances the purchaser selects the worm, brings the number having this drive very close to the number using the bevel gear. The new models appearing on the market for the first time this season are for the most part using the worm drive, and Daimler for instance in the new 20 takes advantage of the worm shaft by extending it back and mounting the foot-control service brake upon it. Many of the new worm drives show the worm placed above the wheel, a type of design which is adapted for two reasons, first because the driveshaft can more easily be mounted in a horizontal position and a straight-line drive between motor and rear axle secured; and, secondly, because of the greater road clearance. Chain drive is still used on 8 per cent. of the models shown.

In general there may be said to be a strong tendency toward increasing the silence of the operating mechanism. Chain drive for example is used to a large extent in the timing case as the De Dion illustrated at the top of this page exemplifies. The little details of shackles, etc., show that careful attention is being given to the minor points.

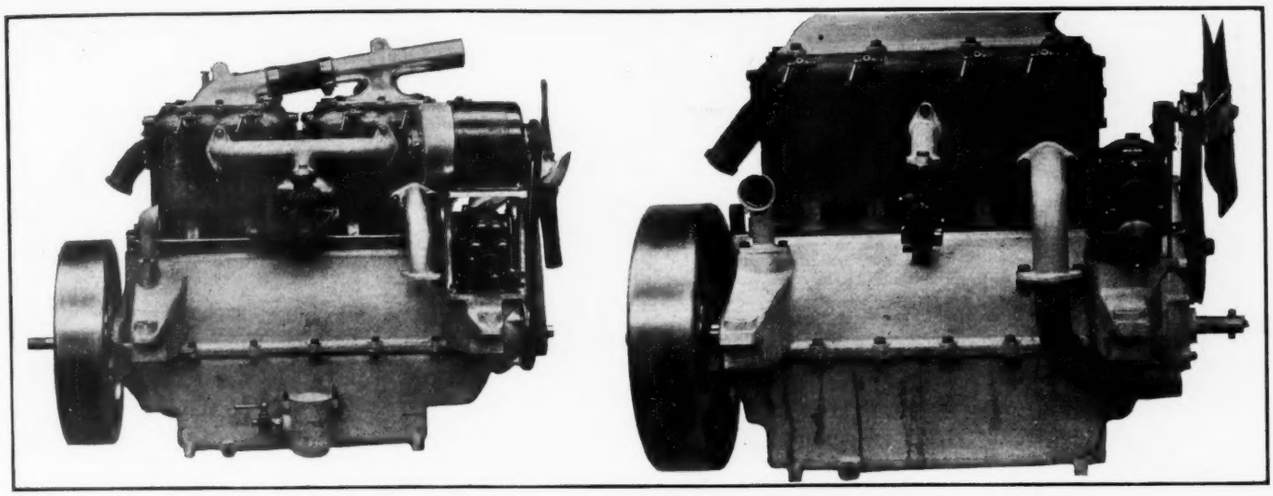


Fig. 10—Side views of the Swift motors. Note the accessibility of the magneto and dynamo

New Features in Design

Many Improvements in Construction Made for Durability, Silence and Accessibility

MANY little kinks which tend to make the car more efficient, accessible or comfortable are to be found in the cars exhibited at Olympia. Wolseley has two features of construction which are new. These are a removable cylinder head casting which serves to combine the combustion spaces, seatings and guides for the induction valve, the intake pipe up to the point of connection with the carbureter and the water jacketing for the cylinder heads including the passages which are in communication with the jackets and with the radiator. This somewhat intricate casting is adapted to carry the spark plugs, the throttle valve and the pivot brackets for the levers which operate the intake valve.

The second Wolseley feature of interest is the combined oil pump and distributing valve used in the lubricating system. One of the spindles of the oil pump, which is of the rotary spur gear type, is hollow and forms a revolving valve for passing the oil to pipes leading to the various bearings in turn. In this manner each bearing receives in turn the full force of the pump and obstructions, if any, are cleared out; at the same time no additional parts are necessary, for one of the wheel spindles forms the distributing valve. Oil is fed into the hollow center of the wheel as shown. The spur wheel which has the rotary valve attached to it is of larger diameter than the other wheel, so that the valve may revolve at a slower speed and may thus be more effective.

Wolseley Springs Unique

In the new springing system adopted by the Wolseley Tool and Motor Car Co., Fig. 9, the prime object is to secure a quicker periodicity between the axle and the body of the vehicle under rolling movement. A semi-elliptic spring is fixed to the frame at its front end; junction is made by a link to a quarter-elliptic spring at its rear end and the axle is suspended from the middle of this spring. A transverse rocking shaft is mounted to the frame of the chassis and arms are connected by links to the free end of the semi-elliptic spring. When the car rolls the transverse shaft is twisted in opposite directions at each end, thus bringing the quarter elliptic springs in operation. For a single vertical movement, however, the transverse shaft rotates freely and the whole of the springs are operative giving a

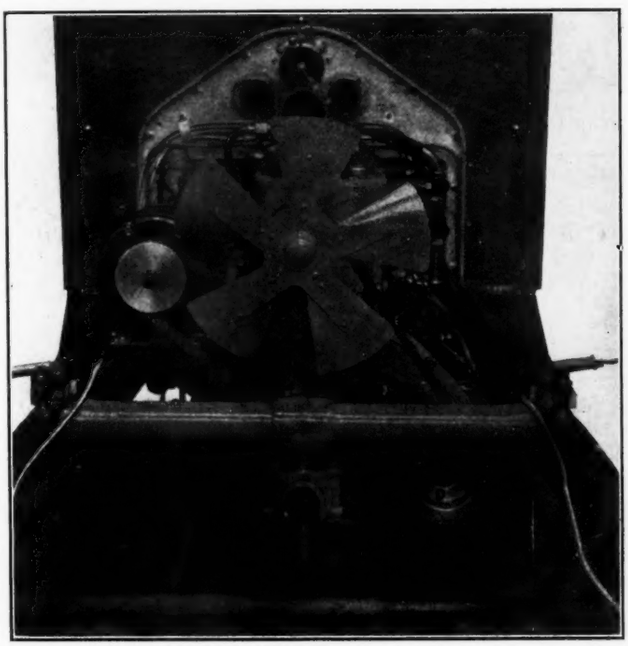


Fig. 11—Front view of Crossley 20 motor. This shows the arrangement of the power plant in the chassis, and also indicates the neat arrangement of the fan drive and timing case

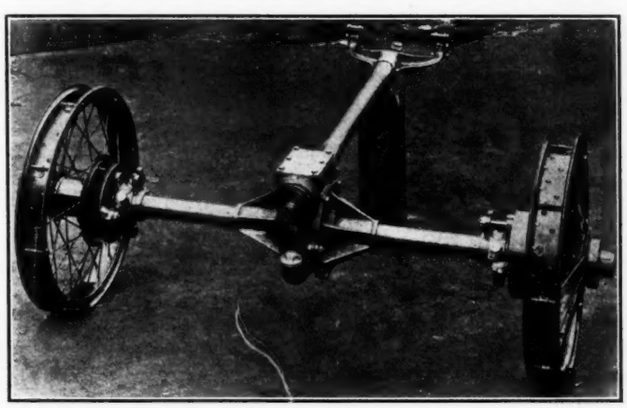


Fig. 12—Turner rear axle with worm drive, showing the position of the worm above the gear wheel and the inspection cover over the drive housing, permitting an easy examination of the rotating mechanism and the bearings

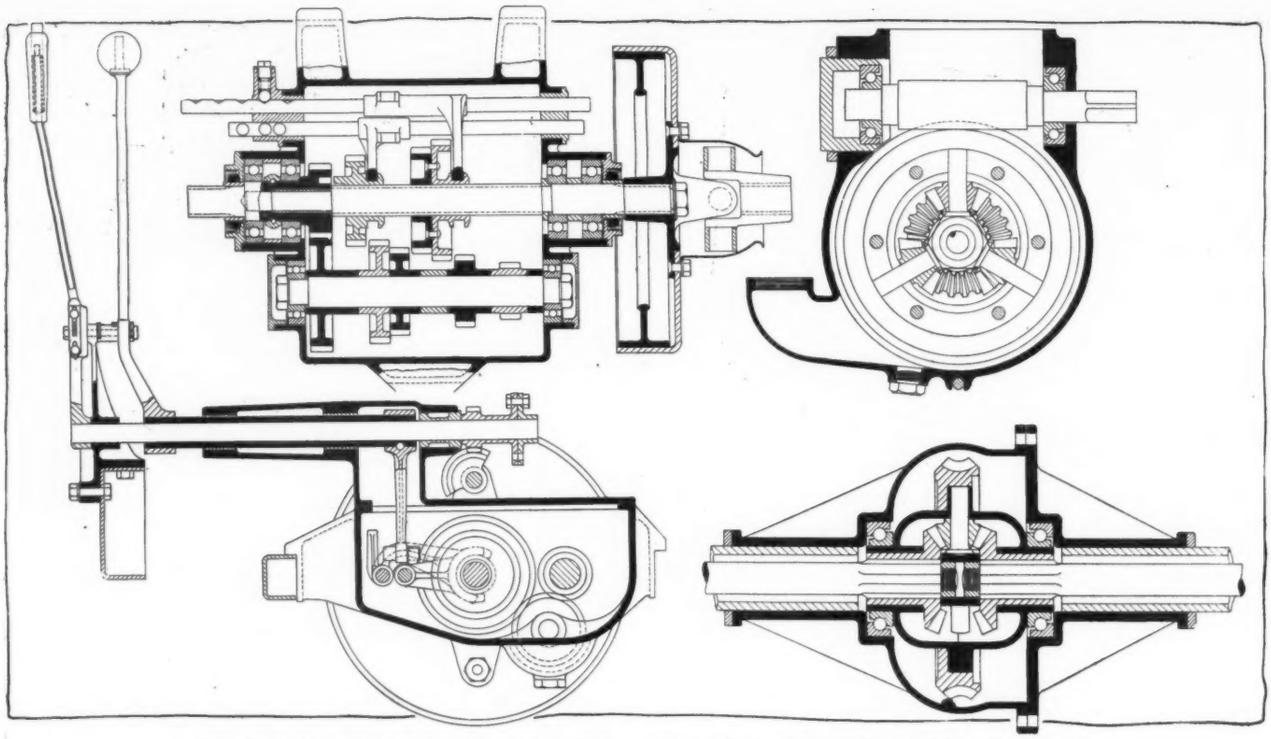


Fig. 13—Left, Calthorpe gearbox and control. Right, Turner rear axle, showing worm drive

true shock absorbing action. This care, taken with spring design, is noticeable all through the cars shown this year at Olympia.

The New Daimler 20

The new Daimler 20 has a four-cylinder engine 90 millimeters bore or 3 9/16-inches. The stroke is 130 millimeters, or 5⅛ inches. The wheelbase is 10 feet 11 inches, the track 56.5 inches. The overall length is 14 feet 8 inches, and the overall width 6 feet. It weighs 1,800 pounds in its chassis form.

The more important distinction that differentiates the Daimler 20 horsepower from the other Daimler models lies in the gearset, for the gearbox, instead of being an independent member between the clutch and the propeller shaft, is, in this instance, incorporated with the central portion of the rear axle casing.

The rear axle is worm driven, as in the case of other Daimler models, but the worm is above the wheel, which raises the level of the axis of the propeller shaft and so avoids the necessity for arranging the engine and transmission on the slope. The engine of the Daimler 20 horsepower is, in fact, horizontal, as also is the line of shafting from the engine to the worm.

Continued from the forward end of the gearbox is a tubular steel casing surrounding the propeller shaft, and this casing terminates at its forward end in a spherically shaped extremity that forms a ball socket joint with a corresponding cup-like member attached to the main frame just behind the clutch.

The transmission is thus completely inclosed from the clutch to the rear axle, and the thrust of the road wheels is transmitted to the car through this tubular casing, which also acts as a torque stay. It is secured to the axle casing itself by diagonal stay rods so arranged as to brace the gearbox also.

A distinctly interesting and uncommon feature of this chassis design is the presence of a brake behind the axle, where it is situated on a prolongation of the worm shaft. This brake is of the internal expanding type, and is operated by foot. It is very easily adjusted, and is altogether in a particularly accessible position.

The side brake lever controls two external contracting band brakes operating upon drums forming part of the rear wheel hubs, as in the construction of the other Daimler models.

The suspension of the new Daimler 20 also differs from the suspension of the other types. It has cantilever springs, that is to say, semi-elliptic springs inverted from their usual position so that the axle is attached to one end of the spring, while the center of the spring and its forward end are carried by the frame. The greater part of the weight of the spring is thus removed from the axle, and becomes part and parcel of the sprung weight of the car instead of being part of the unsprung weight of the axle itself.

The frame of the Daimler 20 has parallel steel side members of standard type. It is laterally braced by a massive transverse channel section member that supports the upper end of the propeller shaft casing, and by another channel section member that is arched to pass below this casing nearer the rear axle.

The engine has its cylinders cast in pairs, and is similar in design, although having two cylinders less than the six-cylinder Daimler 30 engine. It differs from the Daimler engines of 4-inch bore in having the transverse shaft, which drives the water pump and the magneto, situated in front of the first cylinder, instead of between the first cylinder and the second cylinder.

Also, in order to accommodate the dynamo without increasing the bonnet length, this transverse shaft is placed obliquely so that the magneto is in part above the dynamo. In this position the magneto is even more accessible than otherwise, and the dynamo is in a convenient place to be driven by its link belt from the pulley in front of the damper on the forward end of the crank shaft. The transverse magneto shaft is, as in the other engines, driven by skew gearing from the eccentric shaft.

Force Feed Lubrication

The lubrication arrangements are also similar throughout the Daimler models. There is a plunger pump operated from the eccentric shaft which delivers oil to troughs and to the main bearings of the crankshaft.

There is no oil gauge on the dashboard, but it is possible to tell whether the pump is operating at any time by pressing a button near the oil filler. If the pump is working properly, the oil is ejected through a spout, and passes through a funnel back again into the sump. Similar convenience is also provided with respect to preventing the excessive filling of the sump with fresh

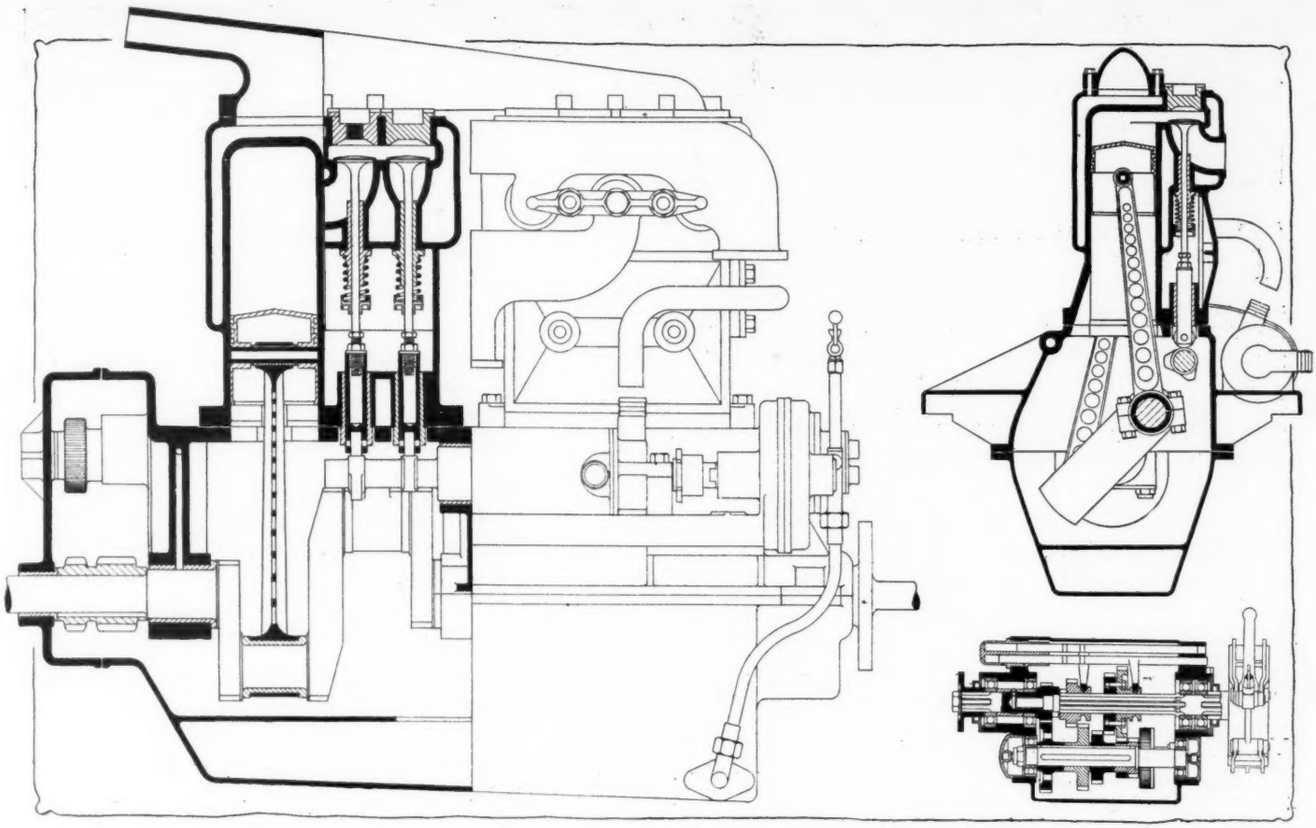


Fig. 14—Star engine and gearbox. Note the pierced connecting-rod of light design

oil. When the cap over the oil filling hole is opened, it also opens a drain cock in the base chamber of the engine and oil runs out of this cock when the sump is sufficiently charged.

The troughs that lubricate the big ends of the connecting-rods are automatically raised nearer to the big ends when the throttle is opened. There is thus a relationship between the amount of lubrication and the work done by the engine. The new Daimler carbureter is fitted to this car.

Control of the Daimler 20 is also on standard lines. It has the usual disposition of clutch, brake and accelerator pedals, and, in addition, it has throttle and ignition levers above the steering wheel. The change-speed lever, which operates in a gate quadrant, controls three forward speeds and a reverse.

This car is not fitted with a starter as a standard equipment, but provision is made for including it as an extra. The chassis can also be bought without the dynamo if the purchaser does not desire to have an electric equipment. Whenever the dynamo is fitted the chassis price includes electric side and tail lamps.

Swift Cars in Three Models

There are three models of Swift cars, namely 15.9 horsepower, four-cylinders, 80 by 130 millimeters, 11.9 horsepower, four-cylinders 69 by 120 millimeters and the two-cylinder light car. The 15.9 and the 11.9 are somewhat similar in design, the larger model having separately cast cylinders, while the 11.9 has block cylinders.

The crankshaft is a three-bearing one having good bearing surfaces. Oil is forced through the hollow shaft to the bearings, the remaining surfaces being dependent upon splash. The casing of the skew gearing driving the pump is enlarged so as to form an oil filler through which the oil sump may be replenished. There is an overflow tap to gauge the correct height for the oil. Cowl-shaped breathing-pipes are placed upon one of the retaining brackets at the rear of the engine; the short and direct carbureter intake communicates with a port passing between the cylinders. The large water intake pipe at the forward end of the cylinder and the cast aluminum hood to collect the hot water and conduct it to the outlet pipe to the radiator and the well-designed cast boss of the fan are good features. The 15.9 engine has also forced lubrication to the crankshaft, etc. The gearboxes of both chassis have four speeds with gate-change. The shafts run on ball bearings. The final drive is by bevel gear. The differential casing is on ball bearings and is in two sections divided vertically and bolted to the central portion. The torque is taken to a V-torque member furnished with buffer springs at its front end.

Crossley Cars for 1914

The Crossley company have only two models, a 15 horsepower 3.125 inch bore by 4.75 inch stroke and a 20 horsepower model 4 inch bore by 5.5 inch stroke.

The 15 horsepower model is in addition made with a stroke 3/8 inch longer, the chassis being turned out with a peaked bonnet and sloping radiator, and termed the Shelsley model, and is a typical example of what is generally termed a sporting model.

Thermo-syphon cooling is adopted in all models, leather faced cone clutch and four-speed gearbox. The fourth or direct speed is by means of an internally cut gear wheel meshing with the same wheel on the sliding shaft which operates for the third speed. It should be noticed that the constant mesh wheel is provided with a ball bearing on both sides, a system which is being adopted in all new gearbox designs.

The universal joint between the gearbox and the engine is of the split ring type, oil retaining lubricators being fitted to each of the universal joint pins. The brake drum is ribbed for cooling. Behind the brake drum will be seen the torque ball at the top of the propeller shaft inside which the universal joint runs.

Turner Cars in Two Powers

Turner cars of two powers are being manufactured, namely, 10 and 12 horsepower. The 10-horsepower engine has four cylin-

(*Continued on Page 977.*)

THE VAUGHAN A CAR OF DISTINCTION

THE Vaughan Car Co., Inc., Kingston, N. Y., has entered the 1914 market with a new design of six-cylinder car which, in addition to many refinements in chassis design and construction, carries a line of five body styles all replete in the niceties of design, the touring car, the roadster, the four-passenger type, the limousine and the convertible inside-drive type, all exhibiting features that are characteristic of the latest in lines and fixtures. The company has tested the new line on the road for many months and has its manufacturing plans well under way.

The new Vaughan is a good example of the latest unit motor and gearset with block cylinder design carrying a complete electric cranking and lighting equipment. Power transmission is through a multiple-disk clutch, a four-speed gearset with direct drive on third with the fourth speed geared higher than direct, double-jointed propeller shaft drive together with an improved system of rear spring suspension. The steering wheel is on the left, the cowl board carries all of the indicating instruments, the car equipment is complete and all bodies are fitted on the same 138-inch wheelbase. The touring car model lists at $2,750.

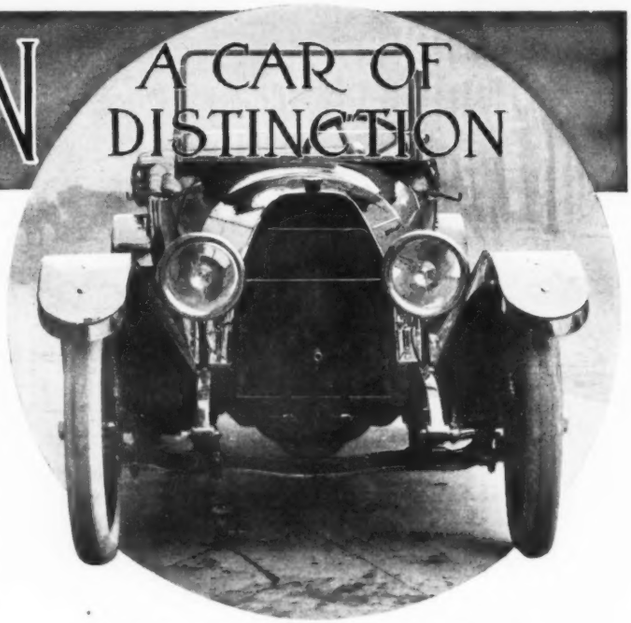


Fig. 1—Front view, showing high, narrow radiator

Vaughan Bodies of Exceptional Design

Although the Vaughan chassis carries many characteristics, the bodies, too, lend an air of distinction, the clean-cut streamline effect running unbroken from the radiator to the back. The radiator, narrow and high, has given the body designer free scope to carry this streamline past the cowl without a break and give a body of exceptional roominess and yet providing a racy appearance. It exemplifies the streamline trend carried out in every particular, there being no break in the contour. From the radiator the lines are straight to the end of the bonnet where they gradually slope into the cowl with a slight upward curve, which blends into the downward sweep leading to the straight line along the top of the doors and sides of the body to the rear. Here the line again curves without a break, forming the back of the tonneau.

There is no break at the windshield as the windshield base and filler piece are a single bronze casting conforming to the contour of the dash, which is designed to accommodate a rain vision, ventilating windshield. The doors are exceptionally wide, measuring 24 inches, while additional space is gained at the rear by allowing the body to extend as far over the wheels as possible, this giving the rear seat a width of 43 inches. The upholstery is 9 inches deep.

The chassis, embodying a unit power plant supported at three points, uses a six-cylinder L-type block motor with cylinders 3.75 by 5.5 inches. These dimensions give an S. A. E. rating of 33.75 horsepower and on the block the motor shows 50 horsepower at 1,500 revolutions per minute. As is usual with cars having the steering wheel on the left, the valve side of the motor is placed on the right, one camshaft driven by helical gears serving for both sets of valves. Both manifolds are carried high enough on the right to permit the removal of the valve cover plates and not to interfere with valve spring adjustment. The exhaust manifold carries ribs to aid in carrying off the heat. The Rayfield model D carbureter is carried on this side and suspended direct from the intake manifold, a two-bolt flange serving as the attachment. The intake manifold is held in place by dogs and studs, the same dogs also holding the exhaust manifold. Manifolds do not interfere with the carbureter.

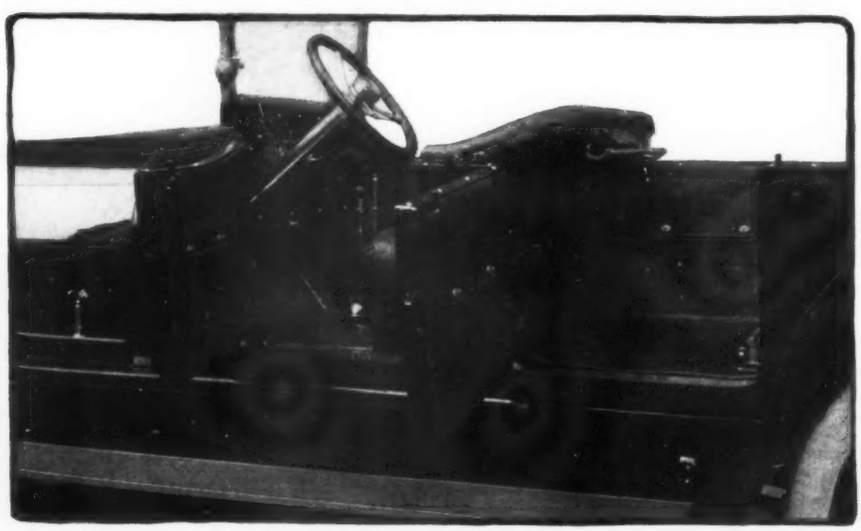


Fig. 2—Doors of great width harmonize with the general body design

The gasoline system is a pressure feed one with the tank, swung on the rear of the chassis, carried in steel straps hung from an extension of the frame, and with a capacity of 22 gallons. It is supplied with a 3-gallon reserve. The air pressure for the feed is provided by a Hancock air pump built into the motor. Gasoline is fed at a pressure of 2.5 pounds per square inch, and for starting, pressure is supplied by a hand pump. The engine air pump is powerful enough to take care of normal leakage and under ordinary circumstances pumps the excess air through an escape valve.

The electric equipment consists of a Mea magneto and a Bijur 6-volt electric lighting and starting system. For ignition the magneto alone is relied upon as the electric cranking motor rotates the crankshaft at 115 revolutions per minute. The amperage drawn in spinning the motor is 122. A feature of the

cranking motor is the method of engagement with the gear on the flywheel, in that when the starting motor is put in motion by depressing the foot switch, a gear, carrying on its lower part a pendulum which holds it in a fixed position, travels along a worm on the shaft until it meshes with the flywheel gear, when it starts spinning the motor and as soon as the motor picks up, the action of the worm carries the gear again out of mesh.

The battery used is a 100-amperehour Willard, which is charged when the motor speed is above 225 revolutions per minute.

Electric Starting Used

The Bijur generator is of the constant-voltage and varying-ampere type and starts charging at a 20-ampere rate, a bucking coil in the winding preventing an excessive charging rate at high speed. A feature of the entire electric installation is the short wiring. For the lighting system the single-wire method is used and for the starting system the double-wire method. In the wiring arrangement all the body wires are carried entirely on the body and all the chassis wires entirely on the chassis. Connections are made in a junction box located on the dash, and this box is so arranged that each terminal is of different size, thereby avoiding any chance of confusing the wiring. To remove the body from the chassis it is not necessary to break any connections except at the junction box. All wiring is carried in flexible conduits.

The motor oiling system is a combination force feed and splash one, a self-contained positive feed pump carrying the oil from the reservoir in the lower portion of the crankcase to the main bearing of the crankshaft, thereby furnishing these bearings with positive lubrication. The excess oil drains from these bearings to pockets in the bottom of the crankcase so arranged that the connecting-rods ends dip into them, the spray lubricating the cylinders, camshaft and connecting-rods and keeping the entire interior of the motor filled with oil spray. The excess oil above the level of the splash pockets flows through the holes back to the reservoir. An indicator showing the level of the oil in the reservoir is placed close to the combination crankcase breather and filler tube.

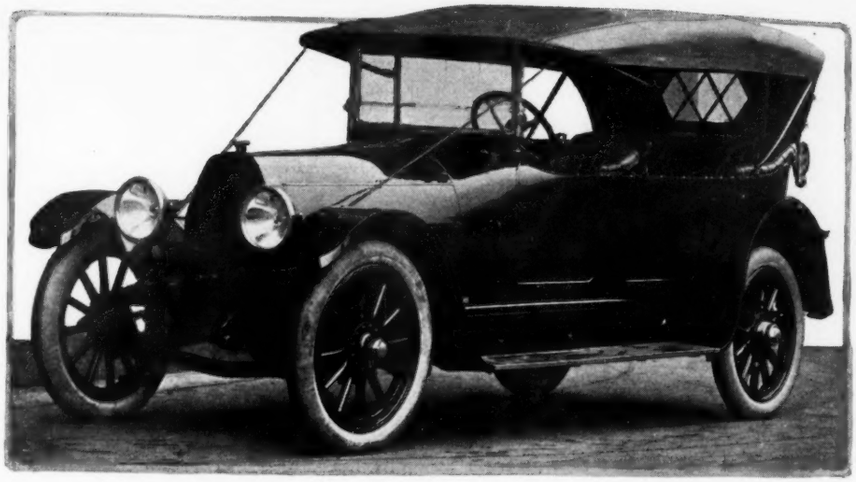


Fig. 3—The touring car represents a perfect streamline form

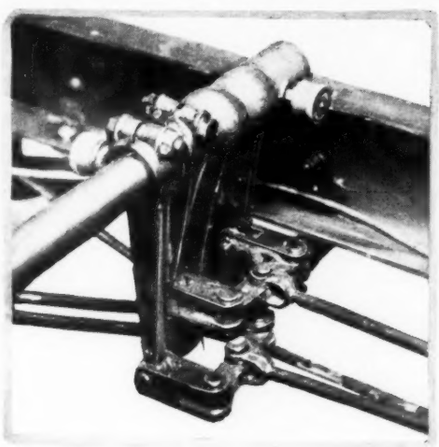


Fig. 4—Brake equalizing mechanism

The cooling system has been given unusual attention. At first sight it would appear that the narrow radiator had cut the cooling space, but a closer inspection shows that the area is in excess of the natural motor requirement as the radiator has a surface of 416 square inches, and a thickness of 4 inches. Calculating on the average requirement of 10 square inches of radiator to a horsepower, the radiator is capable of taking care of a steady output of 41.6 horsepower. In addition to the large radiating surface, special provisions have been made to take care of the air which passes through the radiator. The swirl from the fan blades is thrown through the three louvres in the bottom pan, thereby obviating all possibility of carrying any dead air under the bonnet. A still further provision for removing the air as fast as it is carried through the radiator is the placing of a screen of gauze between the dropped portion of the frame and the sill. These provisions, in connection with an efficient four-blade pressed steel fan operating at three times crankshaft speed, give a highly adequate cooling service.

The moving parts within the motor show careful workmanship. The pistons carry four eccentric rings each 3/16 inch in width and all above the wristpin. The valves are 1.625 inches in diameter. The cams are integral with the camshaft. The cam-

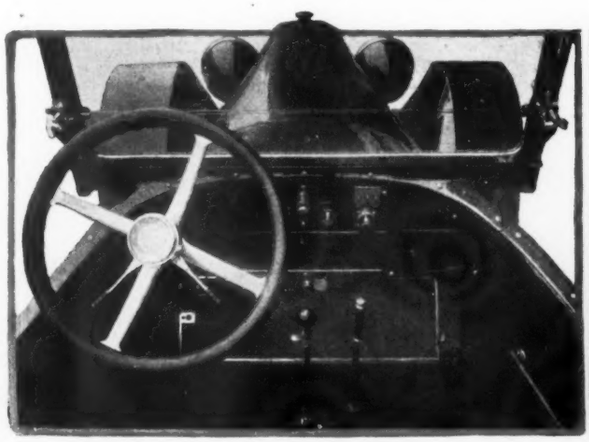


Fig. 5—Control features accessibly mounted

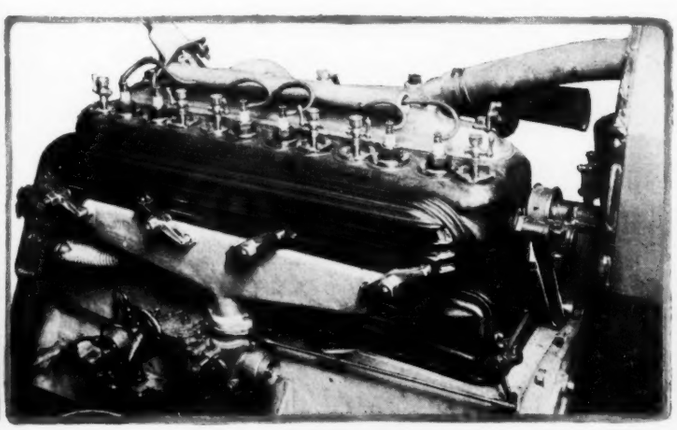


Fig. 6—Motor cylinders are cast in a single block

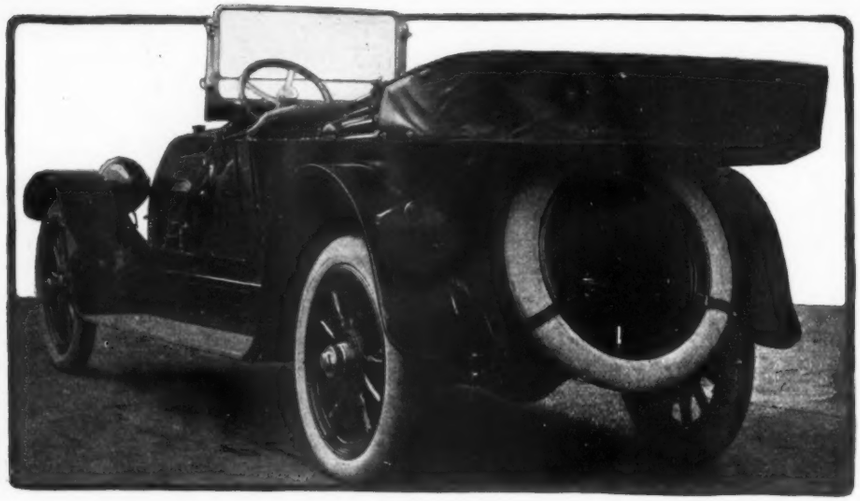


Fig. 7—Tires are carried on rear, runnings boards clear

shaft forging is of open-hearth steel and the cams have their working faces case-hardened. The four camshaft bearings are bushed with bronze and the shaft terminates at the forward end in a flange to which the timing gear is bolted. Piston pins are 1 inch in diameter and are composed of open-hearth steel case-hardened and fitted in the piston bosses by a taper setscrew and cotter. The piston pin bearing at the upper end of the connecting-rod carries a bronze bushing giving a bearing 2¼ inches in length.

The connecting-rods are of I-beam section and are 11.5 inches in length. The lower end bearing is 2 by 2 inches. The connecting-rods have no offset and the connecting-rod bearing cap bolts are of heat-treated steel.

The crankshaft is a drop forging of open-hearth carbon steel adjusted for balance on a Norton running balance machine. The diameter is 2 inches at the front end and 2.5 inches at the back, giving the following dimensions for the four bearings: Front, 2 by 3.5 inches; two center, 2 by 2.5 inches; rear, 2.5 by 4 inches. These bearings have bronze shells and the Babbitt metal lining is run in the shells.

The clutch is a multiple-disk type, carrying nineteen plates, nine faced with Raybestos and ten with steel. The clutch is the dry type and is in unit with the motor and gearbox, the crankcase being extended back to inclose the flywheel and also to house the gearbox.

Four-speed Gearbox Provided

The four-speed gearbox geared above direct on fourth, furnishes a ratio of 3.04 to 1 between the motor and rear wheels and on direct or third a gear ratio of 3.8 to 1. It is carried on the frame and forms the rear supporting member of the unit powerplant. The gears are 3.5 per cent. nickel steel and the nickel-steel shafts are splined. The gearshift lever is a rocking type and does not work in the customary H-quadrant. The movements of the shifting lever, however, are very similar to those of the H-type with the exception that, instead of moving the entire lever, it is rocked about a fulcrum and then moved either forward or backward to secure the different gear changes. The gearshift lever is in the center of the car and is mounted directly on the gearbox cover, the casting being so shaped as to provide for the lever.

The speedometer drive is mounted on the gearbox Fig. 10. The gear wheel which furnishes the drive to the speedometer gear is mounted on the shaft behind the gearbox and in front of

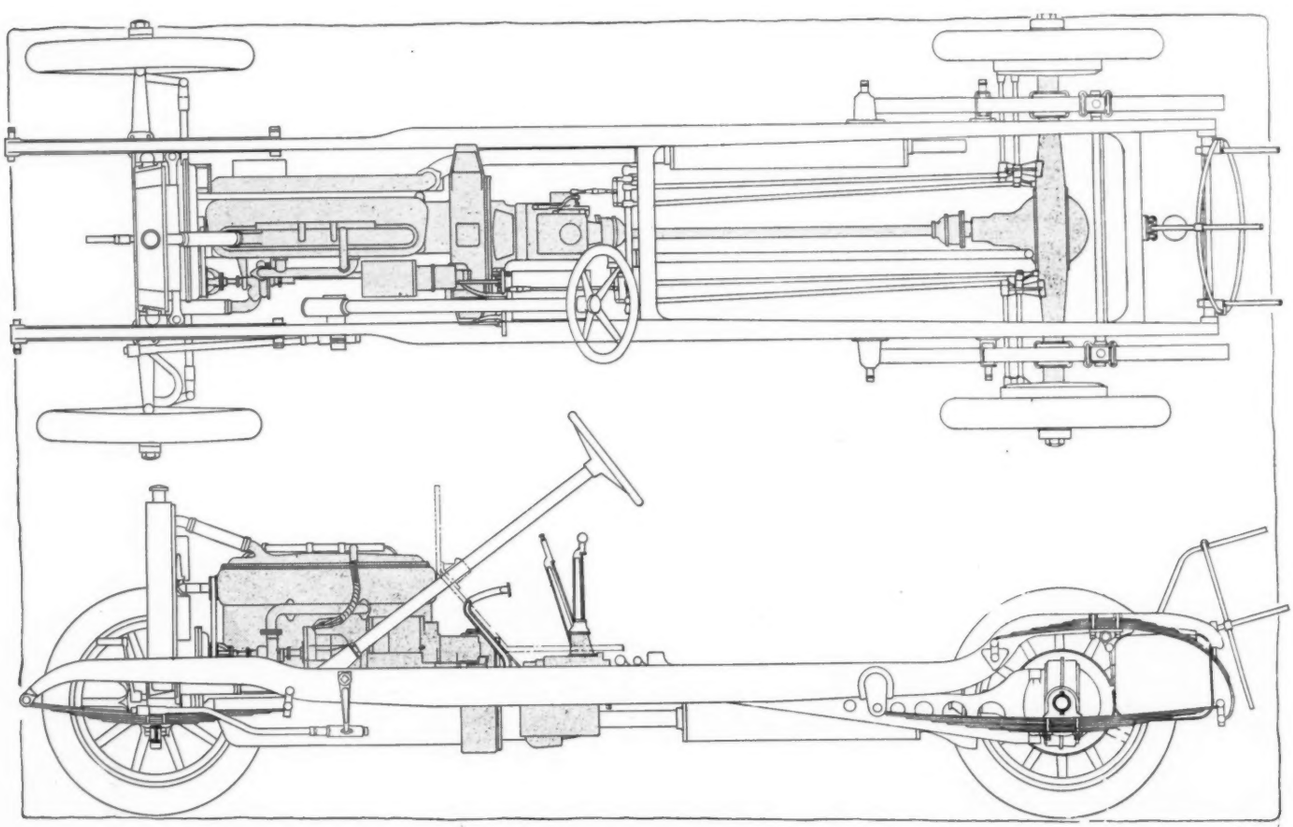


Fig. 8—Plan and side views of Vaughan chassis, showing arrangement of the drive mechanism and suspension

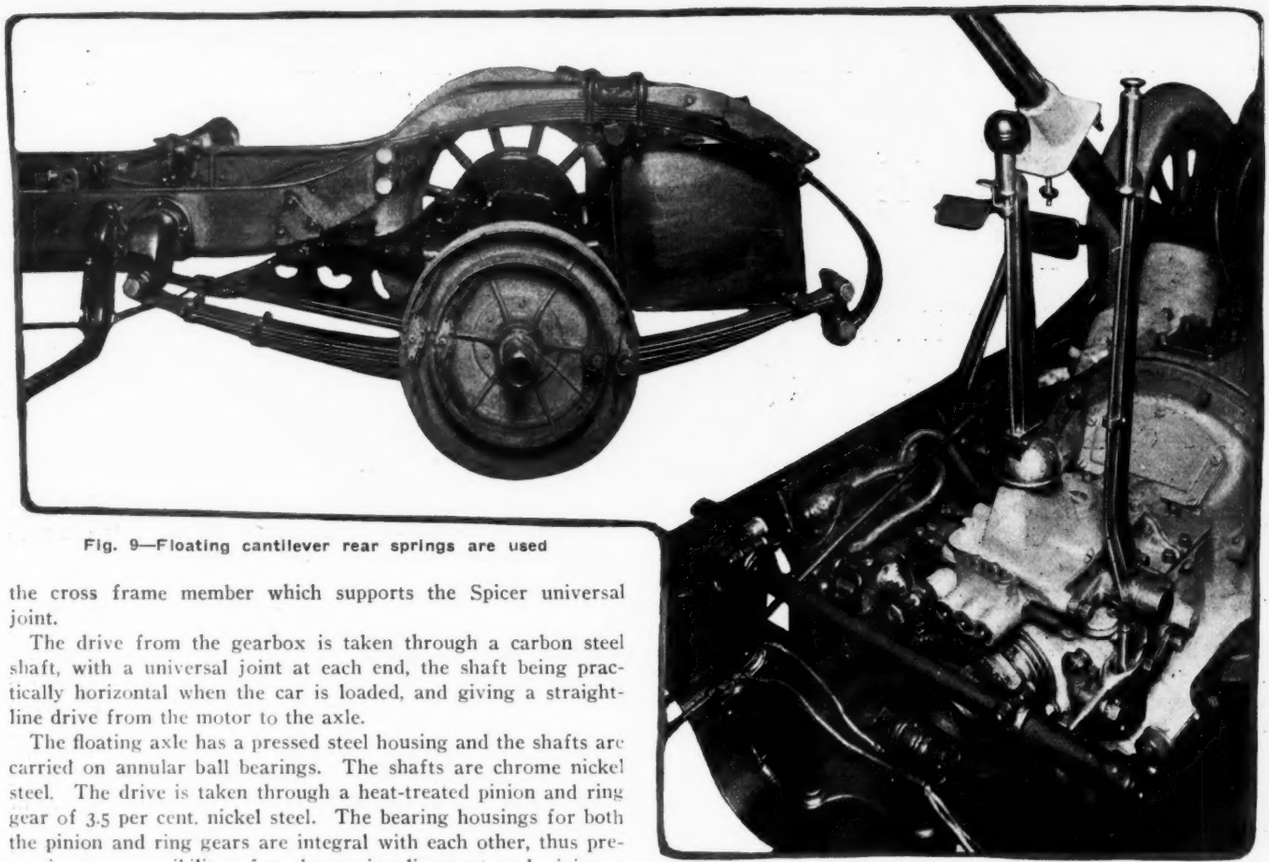


Fig. 9—Floating cantilever rear springs are used

the cross frame member which supports the Spicer universal joint.

The drive from the gearbox is taken through a carbon steel shaft, with a universal joint at each end, the shaft being practically horizontal when the car is loaded, and giving a straight-line drive from the motor to the axle.

The floating axle has a pressed steel housing and the shafts are carried on annular ball bearings. The shafts are chrome nickel steel. The drive is taken through a heat-treated pinion and ring gear of 3.5 per cent. nickel steel. The bearing housings for both the pinion and ring gears are integral with each other, thus preventing any possibility of a change in alignment and giving a construction which permits the gears to be removed from the axle housing to allow of adjustments being made on the bench.

The Lemoine type front axle carries annular type bearings which are designed to afford a large factor of safety on radial load. To take care of the end loads due to steering and road shocks, thrust bearings are fitted which relieve the ball bearings of any duties in this direction.

Steering Gear Adjustable

The steering gear is chiefly noteworthy for the fact that at every point at which wear can result from use this wear is taken on eccentric bushings. Lost motion at any point can be taken up and replacements of large parts through wear are afforded. The worm has a triple thread of large diameter and is made of hardened nickel-chrome steel. It is fitted with bore thrust washers at the top and bottom and meshes with a complete gear. The cross shaft is of carbon steel heat-treated and ground.

The drive from the wheels is taken through a torque member, while the lower members of the rear springs act as radius rods or distance pieces. The torque member is pressed steel and is fixed to the rear axle housing and supported at the front end by a large ball and spring socket. The rear springs, which are worthy of attention in that the upper member does as much work as the lower, are of the floating cantilever type, which, briefly described, resemble a three-quarter elliptic, except that at the point where the upper member would naturally join the frame, it is carried on through and at this point a bearing is inserted with spring clips and at the forward end the spring is shackled. The rear spring shackle is so arranged that it is impossible for it to turn over through a severe jounce. The rear springs are 52 inches long and the front springs are 40 inches long.

The road wheels have ten spokes in front and twelve in the rear, all being 1.75 inches in width. Wheels carry 35 by 4-inch demountable rims. Wire wheels are supplied if desired at an extra cost of $250. Both sets of brakes are on the rear wheels,

Fig. 10—View of the transmission assembly. Note speedometer drive from gearbox

the service brakes having a drum diameter of 15 inches and a face width of 2 inches. The brake rods are made of ¾-inch steel tubing with electrically welded yoke ends. The brake adjustment can be made by removing one of the footboards, which renders the brake adjustment features accessible. The emergency brake lever is mounted in the center of the car to the right of the gearshift lever.

The control system is standard throughout. The steering wheel is mounted on the left side and the dash instruments are on a cowl board. On the end of the steering column and mounted with it as a unit is a Waltham clock. The carbureter adjustment device, Bijur generator indicator, magneto switch, etc., are all arranged within easy reach.

Side Frame 6 Inches Deep

The frame is a channel section of carbon steel. It is tapered at both ends, giving uniformity of strength and at the same time reducing the total chassis weight, which amounts to about 2,800 pounds. The depth of the channel is 6 inches, giving a perfectly rigid structure throughout the entire length. The frame is dropped and the clearance of the car is 9.75 inches. The floorboards of the touring body are 26 inches above the ground.

Molding as Limousine Door Protection

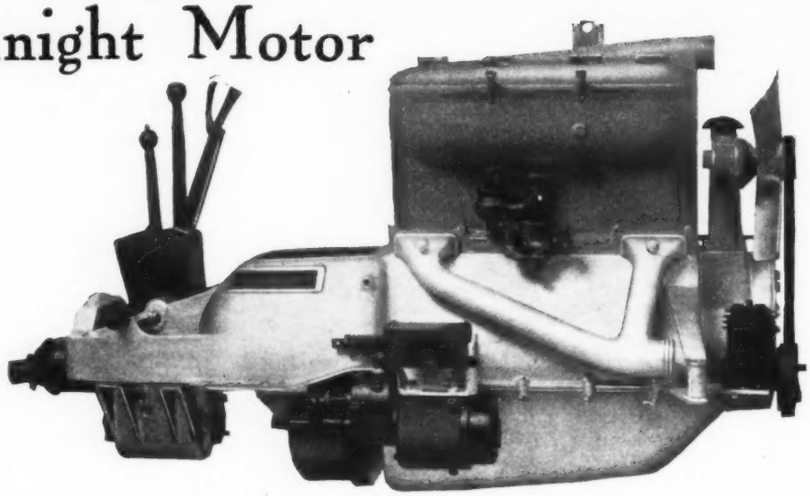
A rain-conveying molding over the door entrance to the passengers' compartment has been featured on the new Stevens-Duryea limousine. This new detail conveys the rain toward the front and rear of the car, instead of allowing it to accumulate over the door entrance. Instead of the usual wooden molding, this water way was made from aluminum and was an integral part of the body, completely encircling the top of the car. Being constructed of aluminum it is not affected by moisture and retains the same definite shape throughout the life of the car.

Moline Has Knight Motor

To Be Marketed for $2,400—Will Be Built in Only One Model

Thermo-Syphon Cooling—Streamline Body Shows European Touches

First Knight Licensee To Use Four-Cylinder Block Casting —50 Horsepower Guaranteed —Wagner Electric System

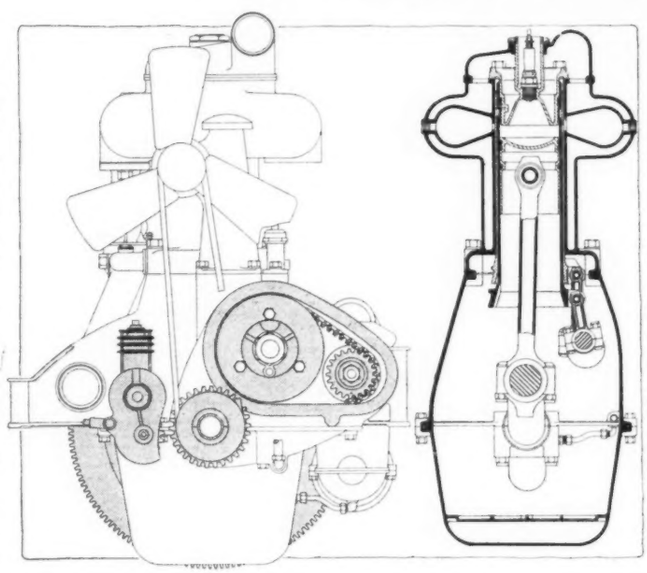


Right side of new Moline-Knight motor, showing integral intake manifold and large water connections for thermo-syphon system

THE Moline Automobile Co., East Moline, Ill., has taken out a license to build the Knight sleeve-valve motor, and has ready for next year a model of this engine, known as the Moline-Knight, which will be marketed at $2,400, a price lower than that of any other maker of the Knight motor.

This Moline car, while entirely altered by the adoption of the sleeve-valve motor, is continued with the same chassis characteristics that have been so well tested out in reliability contests during the last 5 years.

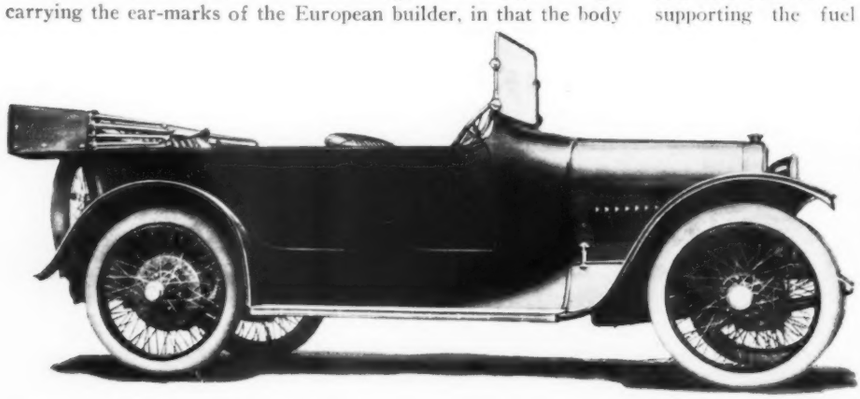
The new model is built in only one type, a five-passenger touring car with the body ironed to take two additional tonneau seats. It is made with a wheelbase of 128 inches, 36 by 4.5-inch tires all around and carries the Wagner electric starting and lighting system.



End section of Moline-Knight showing air pump and magneto shaft drive. At right, vertical section through motor. Note spark plug recess at top of cylinder and conical combustion chamber

On the Moline-Knight is a new body, a streamline design, carrying the ear-marks of the European builder, in that the body line is continuous from the radiator to the rear, which is accomplished by having the rear of the bonnet made flush with the cowl, not a rupture in the streamline effect occurring at this point. The body sides are exceptionally high, being almost flush with the top of the seat backs.

Special attention has been given to the framing of the body, chiefly to prevent that sagging and springing in service, which means sticking or gaping doors. Instead of the usual main sills, heavy and laid flat, Moline sills are skeleton truss constructions 12 inches in depth, which eliminate the possibility of the body bending and causing rattling doors. There are no side lamps, nor are there boxes on the running board to mar the clean lines of the body, the side lamps being supplanted by a dimming arrangement in the headlights. The tires are carried in a rather novel holder, which sets into sockets on the rear end of the frame, the latter also supporting the fuel tank. The fenders are crowned and without rivets.



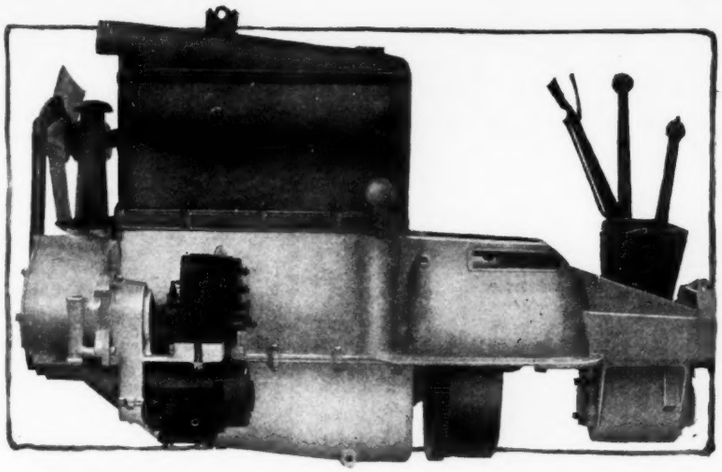
New Moline-Knight with five-passenger streamline body ironed for seven-passenger service and selling at $2,400. Wire wheels are optional

That the Moline company contemplates continuing this type of motor for some time is evidenced by the complete line of special jigs, dies and machine tools for quantity production which becomes apparent upon an inspection trip through the plant of Root & Van Dervoort, the engine portion of the Moline company's factory.

Coincident with this change in the Moline power plant, a new nameplate appears, and the familiar Dreadnought is discarded. The central idea is a medallion of Sir Galahad, the most nearly perfect of King Arthur's Knights of the Round Table, to symbolize the Moline

force's faith that the car is the most nearly perfect of the twentieth century Knights. On either side are the words Moline and Knight. The colors are blue and gold, as were the colors of the original Knights of the Round Table.

The Moline-Knight motor is an example of the latest European construction with this sleeve-valve type, and, in fact, goes a little further than most of the European licensees have gone, in that it uses a four-cylinder block casting, being one of the first to use block design; it uses thermo-syphon cooling, playing the rôle of a leader in this respect, and it has both the intake and exhaust manifolds cast integrally with the cylinder casting, giving a most clean-cut appearance to the power plant; this is a unit design with the upper half of the crankcase continued rearward and having the gearset bolted thereto, all carried on a three-point suspension system.

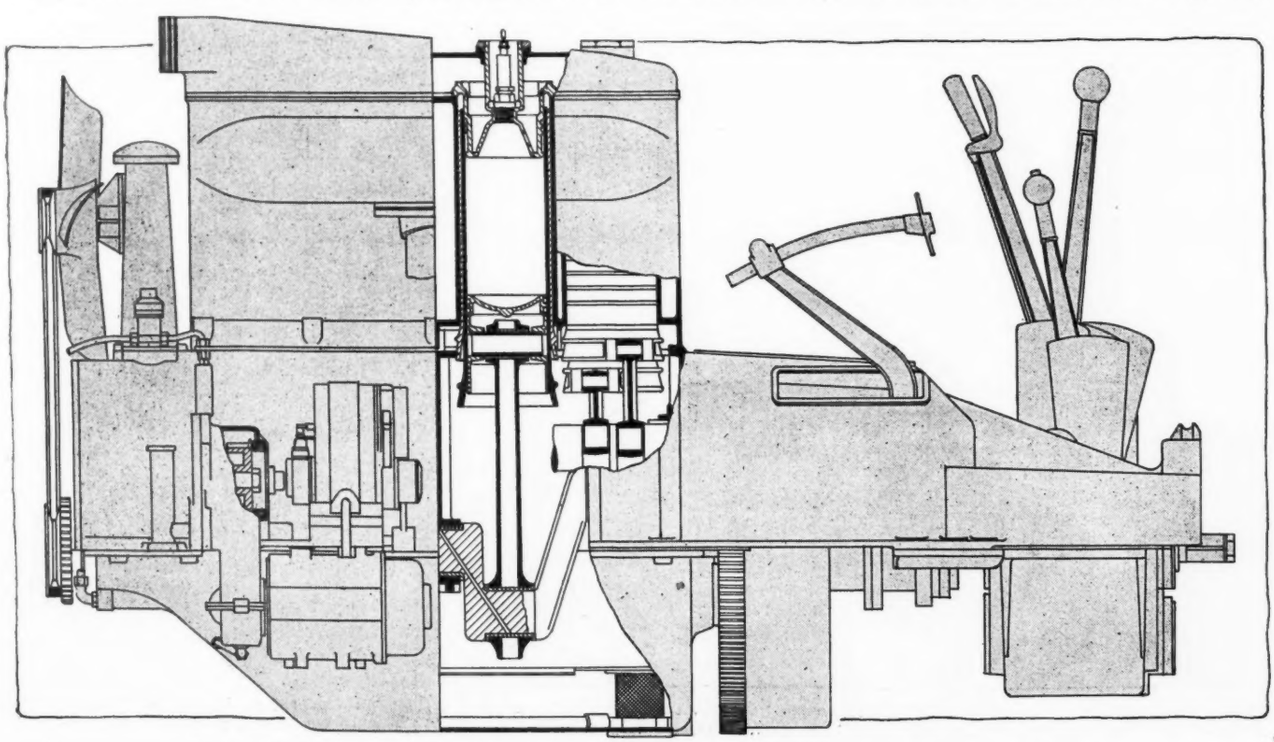


Exhaust side of New Moline-Knight motor showing integral manifolds and compact mounting of Bosch magneto and Wagner generator on same bracket

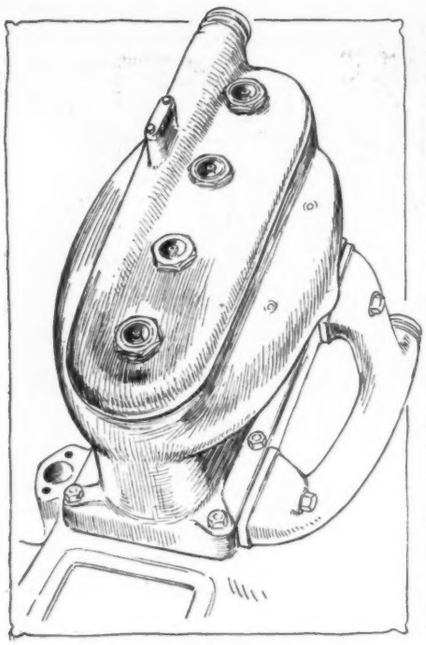
The motor, a 4 by 6 size, is given a rating of 25.6 by S. A. E. formula, but in shop tests shows 65 horsepower at 1800 revolutions per minute, at which speed the tests were stopped because of the limitations of the fan dynamometer. Yet at this point the power curve was still rising at its average rate. Power ratings of this amount are to be expected by a Knight design and are only in keeping with the horsepower output of European makers. An example of this is the Lorraine-Clement in Austria, which, with a motor slightly smaller than the Moline-Knight, 3 15/16 by 5⅞ inches, develops 75 horsepower at 2200 revolutions per minute. The Moline company is marketing this new Knight type with a guarantee that it will develop 50 horsepower.

Every detail in connection with the cylinder design has been carefully worked out by the Moline engineers under the direction and assistance of the consulting engineers of Knight & Kilbourne. Waterjacketing has received the lion's share of attention, an example being the waterjacketing of the cylinders throughout the entire length of the cylinder bore, the illustration of the right side showing how the large-diameter thermo-syphon intake pipe connects with the block casting at its base. One large plate covers the heads of the four cylinders and leaves an unusually ample water space between the cover and the cylinder head. The cylinder head is a cone-shaped cap with the spark-plug in its center and which sits into the cylinder to a depth of several inches. The space between the center and sides of the cap are in the water circuit, so that the upper ends of the two reciprocating sleeves have water circulation on both sides of them, and the upper half of the spherical combustion chamber is surrounded by a waterjacket. This arrangement is well illustrated in the sectional diagram on page 960. The reciprocating sleeves throughout their entire length, except at the ports and at their extreme lower ends, are surrounded by water.

Thermo-syphon circulation is used, the only instance of Knight construction in which a pump is not used. The cylinder cover plate forms the upper water manifold through which water passes to the radiator. The lower connection from the radiator has two branches, one leading to the forward end and the other to the rear end of the lower edge of the cylinder block, and by which means an equal flow of water is assured to each cylinder,



Part sectional view of Moline-Knight four-cylinder motor showing conical combustion chamber



Bird's-eye view of Moline-Knight block cylinder casting showing clean compact design

the cooling fluid passing upward along the cylinder barrel, then around intake and exhaust manifold and thence to the cylinder head and through the water outlet.

As might be expected with thermo-syphon circulation and an unusual volume of waterpackets about the cylinders, the water headers are exceptionally large in diameter. The nuts which hold the cylinder cones upon the cylinders are of bronze. This is necessary to prevent their sticking, as they are always in the path of the circulation of water. It will be noticed that the spark-plugs are disposed in little wells which extend through the waterjacket and into the middle of the conical combustion space The concave top of the piston and the conical cylinder cap give a quasi-spherical combustion chamber which approaches very nearly to that generally considered as ideal

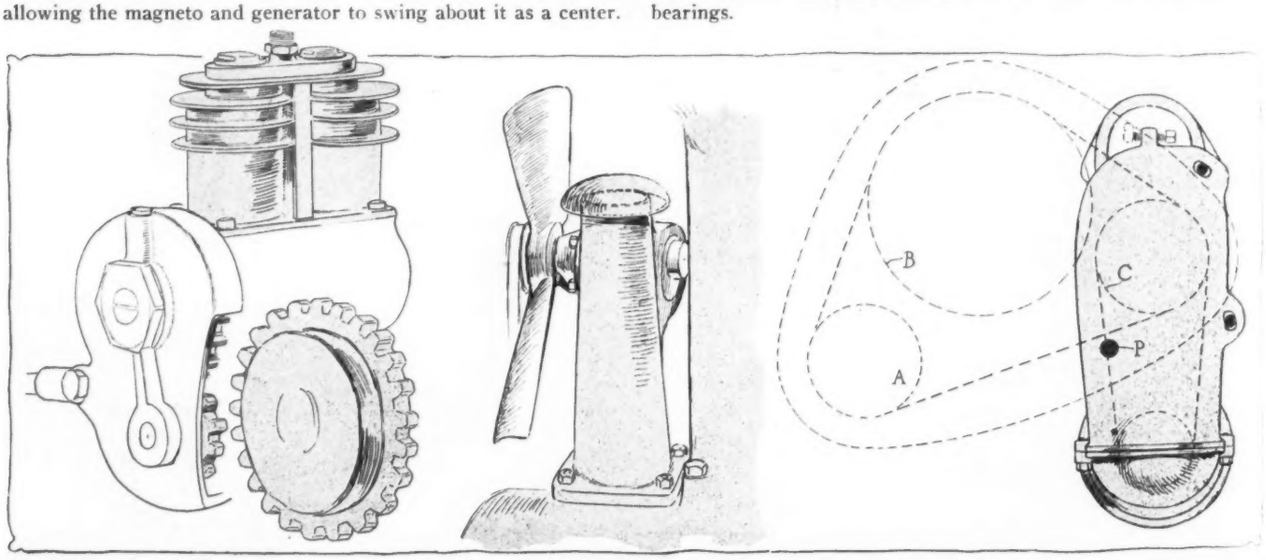
It will also be noticed that the lower ends of the two reciprocating sleeves are reinforced with a skirt or shelf. The sleeve valves are operated by connecting rods from the eccentric shaft, driven by silent chain from the crankshaft, the chain also passing over the sprocket which drives the magneto and the electric generator, the former mounted on top and the latter on the bottom of a base plate on the left. The magneto sprocket is made to serve as the chain drive adjustment in a very ingenious way. This is shown in the illustration at the bottom of the page, in which A is the crankshaft sprocket, B the eccentric sprocket and C the magneto sprocket. The combined magneto and generator base is carried on a long pin P, which acts as a pivot, allowing the magneto and generator to swing about it as a center. As the sprocket C is on the magneto shaft, the latter may be moved in or out around P as a center and the slack in the chain thus be taken up. Movement is provided by a nut-and-bolt arrangement on the timing gear housing, and the generator chain cover has slots instead of bolt holes to permit movement between it and the timing chain housing. However, as the throttle is opened wider, less oil is discharged directly into the sump and more is permitted to pass to the bearings, until with wide open throttle the entire output of the oil pump goes to the bearings.

Connecting-rods are hollow; in fact, true tubular sections, having a 7/8-inch hole which performs an important function in the lubricating system. Oil is forced at a pressure varying from 0 to 40 pounds through drilled crankshafts and hollow connecting rods to every bearing in the motor. The circulation and pressure are maintained by a gear pump which takes oil from a sump in the bottom of the crankcase through a screen and forces it through a manifold which runs along the crankshaft bearing plate the entire length of the motor and parallel with the crankshaft. At the three main bearings leads conduct the oil to the crankshaft bearings.

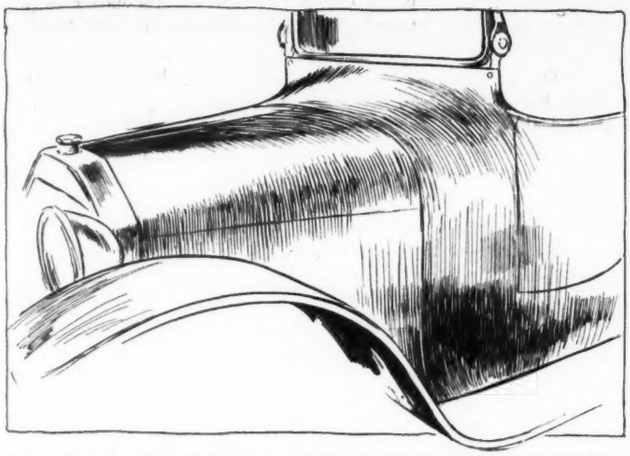
All Bearings Floated on Film of Oil

There are no oil slots in any of the bearings, all bearings of the motor being floated on a film of oil, a system coming into vogue in Europe. At the main bearings holes drilled in the crankshaft lead the oil to the connecting-rod bearings, which are floated in the same way. Here the drilled hole in the crankshaft registers once every revolution with a hole in upward portion of the connecting-rod bearings, which communicates with the hollow connecting-rod. The connecting-rod is full of oil, which is released in the same way to the piston wristpin. The latter is not locked in place in the piston in any way, but is a tube riding freely in the piston and retained only by the lower half of the lowest of the three piston rings.

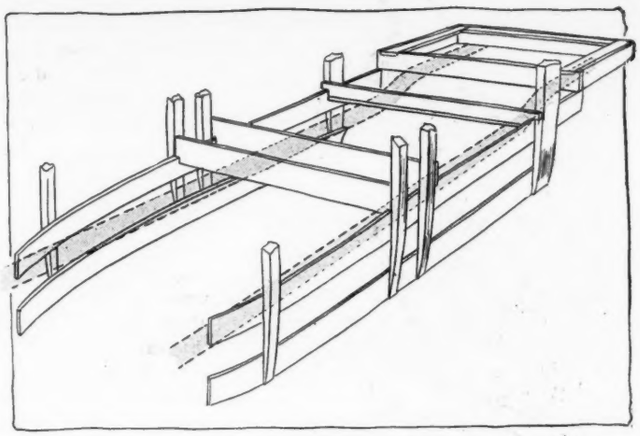
There is a lead to the idler of the chain drive, and this carries oil to the magneto shaft bearing. The maximum oil pressure is 40 pounds to the square inch, but this is only at wide throttle opening. The oil pressure, and thus the amount of oil delivered to the bearings, is regulated by the throttle opening, so that the lubrication control is automatic. The pressure regulation is obtained by means of a three-way cock connected with the throttle and through which the oil is forced just after it leaves the pump. The openings at the top are graduated so that with the throttle closed the cock is discharging the oil directly into the sump and allowing almost none to enter the leads to the bearings.



At left, two-cylinder air pump with driving gears. Center, combination breather pipe, oil filler and fan bracket support. Right, chain drive adjustment by means of magneto sprocket. A is crankshaft, B the eccentric sprocket and C the magneto sprocket. The long pin P acts as a pivot allowing magneto and generator to swing about it as a center. C, being on the magneto shaft, may be moved around P and the slack in the chain thus taken up



Streamline bonnet and dash. Note the crowned rivetless fenders



Skeleton diagram showing the construction of the flush sided body

Particular care seems to have been given to bearing design on the Moline-Knight. The crankshaft at the bearings is 2 inches in diameter, and the forward and middle bearings are 2½ inches long, and the rear one is 4 inches in length. The eccentric bearings are 2 5/16 inches in diameter and the eccentric pins are 1⅛ by 1¼ inches.

Opportunities offered by sleeve valves for large valve openings are taken advantage of by the Moline company to such an extent that the valve openings in the new Knight are twice as great in area as are those in the present poppet type, though the latter motor is of slightly larger cylinder dimensions. Both the inlet and the exhaust slots are 3⅞ inches in length, and the height of the inlet is ½ inch and that of the exhaust is ⅝ inch.

A novelty in fan standards is that on the Moline-Knight, in which the combination breather pipe and oil filler also serves as the base for the fan bracket, as shown in one of the sketches, page 962. The latter is driven by a belt from a small pulley on the end of the crankshaft.

Two-Cylinder Air Pump Fitted

As a part of the motor construction is the two-cylinder air pump for tire inflation, carried at the forward end and driven by gears from the crankshaft. Just behind the fan pulley there is a small spur gear and an idler gear always in mesh with the gear on the pump crankshaft. The idler gear is pivoted so that, by means of a lever which projects to the front of the car under the radiator, it may be swung into mesh with the gear on the engine crankshaft. By this arrangement the pump is not in operation, nor are the gears in mesh except when tires are being inflated, and the pump may be put in operation without lifting the hood.

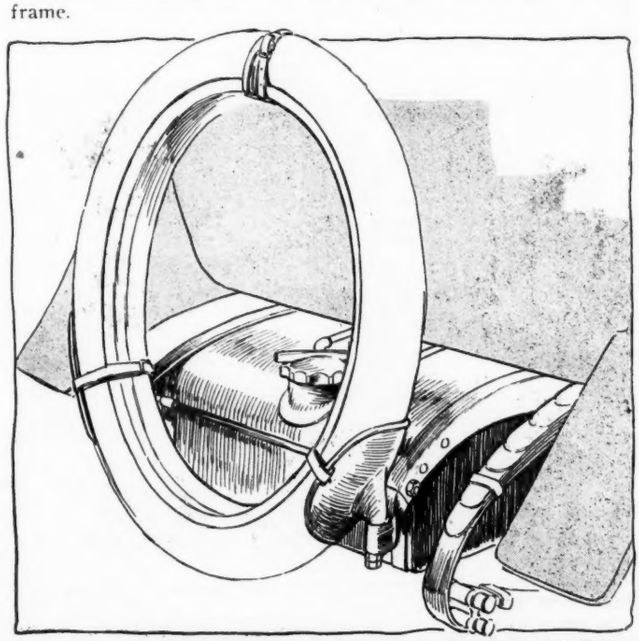
The need for special design of electric system brings out strikingly one of the features of the Knight engine. The extreme silence of operation of the Knight engine makes audible numerous little noises that with the poppet type of engine were unnoticeable. Among these hitherto inaudible sounds was a little squeal due to the rubbing of the brushes on the commutator, consequently it was necessary to use a slightly different design of commutator and brushes.

In other little things alterations were found necessary to accommodate the cranking system. As mentioned previously, the Wagner generator is inverted on the magneto plates and driven by an inclosed silent chain from the magneto shaft. The chain runs in a bath of oil. The Wagner cranking motor drives through steel ring gearing on the flywheel periphery and cranks the engine at 120 revolutions per minute, requiring a current of 220 amperes on the jump, but dropping to 75 amperes as soon as rotation starts. The system is a 12-volt one, although a three-wire lighting system is provided, whereby 6-volt lamps are used in the ordinary way. The battery is a 12-volt LBA of 80 ampere-hour capacity, and is located under the front seat. Instead of the usual pedal for operating the cranking switch and sliding the motor gear into mesh with the flywheel, this function is cared for by a lever similar to, but slightly shorter than, the gear-shift lever, and located beside the latter.

Bosch ignition and Schebler carbureter are features of the motor equipment.

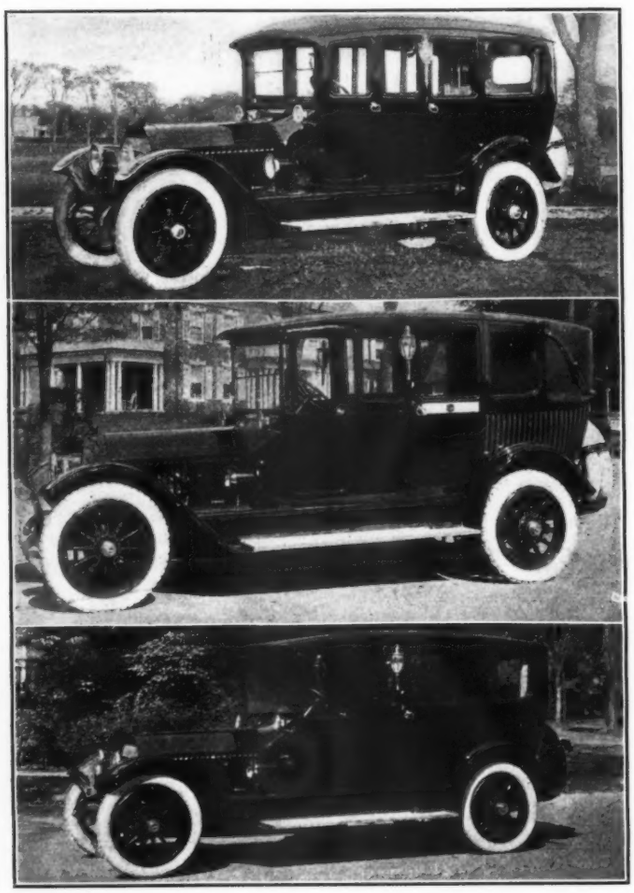
There has been little change in the Moline chassis other than the motor. The former Moline policy of elliptic springs at the rear has been abandoned in favor of the half-elliptic type underslung and shackled at the rear. The floating axle is retained, and the wheels are carried on double annular ball bearings with the wheel flange passing to the wheel by 8 studs. The differential is carried on roller bearings, a means of adjustment being provided which requires only the loosening of four bolts.

The pressed steel frame has a drop over the rear wheels which brings the body slightly nearer the ground than formerly and gives the car a rakish appearance. The wheelbase is now 128 inches, an increase of 4 inches; tires are 36 by 4½ inches, which makes them ½ inch larger in cross section than formerly. The brakes have a drum diameter of 16 inches and are 2½ inches in width. The emergency brakes are expanding shoes. The regular service brakes are contracting bands operating on the outside of the drums. There is a change in the location of the fuel tank, this being removed from the cowl to the rear of the frame.

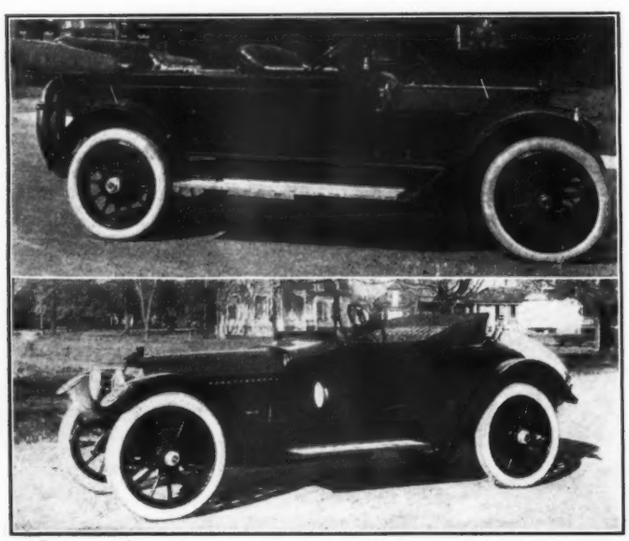


Rear view of Moline-Knight showing protected location of gasoline tank, low-sweeping fenders and mounting of extra tire

Locomobile Concentrates on Four Sixes



Some six-cylinder body types on 1914 Locomobiles. At top, the new Berline. In the middle, a special landaulet made to order. At the bottom, limousine mounted on little six chassis



At top, big six touring car with right drive. Below, little six roadster with left drive, having gearshift levers at driver's right and emergency at his left

Two 38 and Two 48 Models—A Left and a Right Drive Type of Each—Few Changes

LOCOMOBILE has dropped the manufacture of fours and has concentrated on four six-cylinder chassis which offer a choice to suit any purchaser desiring a high-class car of this type. The four chassis naturally divide themselves into pairs as there are two 38 and two 48 models. In each case there is a left drive and a right drive and the models are named accordingly 38 L D and 38 R D, 48 L D and 48 R D, signifying the rated horsepower of the car and whether or not it is left or right drive.

Beyond dropping the four-cylinder models, the Locombile line shows but little change from 1913. In putting left drive on the two sixes it has been necessary to make but few changes and these are principally in the line of a different arrangement of attachments due to the new position of the steering gear. On the left-drive cars a novel feature is the arrangement of the gearshift and emergency brake levers, the gearshift being in the center and the emergency brake to the left. The position of the gearshift lever is such that it fits tightly against the front seat in such a position that while shifting is easy there is no interference in the passageway between the front seats and a single lap-robe may be used if desired.

Another feature which the left-drive cars have which will not be found in the right drive, is the pressure fuel system, these cars having the gasoline tank at the rear with feed by air pressure introduced by a plunger pump driven by an eccentric from the camshaft. The tank pressure is under the control of the operator by means of a pressure-regulating device consisting of a plunger which works against a spring.

The left and right-drive cars weigh practically the same but there are slight differences, due to the greater length of the left drive car both in the 38 or 48. On the 38 or little six right drive the wheelbase is 128 inches whereas on the left drive the wheelbase is 132 inches. On the big six, right drive. the wheelbase is 136 inches and on the left drive is 140 inches.

Improvement Made in Carbureter Design

For 1914 an improved carbureter design is used. The principal improvement is in the needle valve construction governing the fuel level. Mounted on the steering column directly under the steering wheel is an air controlling device which enables the driver to change the richness of the mixture. By pressing a button on the dash, gasoline is drawn directly into the intake manifold, allowing an easy start. The Gray & Davis electric motor starter equipment which was first introduced in 1913 is continued this year as a regular feature.

Body work shows an improvement in cleanness of design. The absence of protruding rivet heads on the fenders adds greatly to the appearance. The standard bodies have a modified streamline form.

The general design of both the 38 and 48 motor is similar. Cylinders are T-castings in groups of two, with waterjackets integral with exception of the separate waterjacket caps. The pistons are of gray iron and in the larger motor are 5.5 inches in length. The pistons are fitted with five rings, four located above the wristpin, and the fifth, which serves as an oil distributor, at the bottom. The wristpins are 2 13/16 inches from the tops of the pistons and are held in their places by two studs locked by a wire passing across their inner extremities.

The wristpin material is chrome nickel-steel case-hardened and it is fitted with a bronze bushing to take the upper connecting-rod bearing. The diameter of the wristpin is 1.125 inches on the 48.

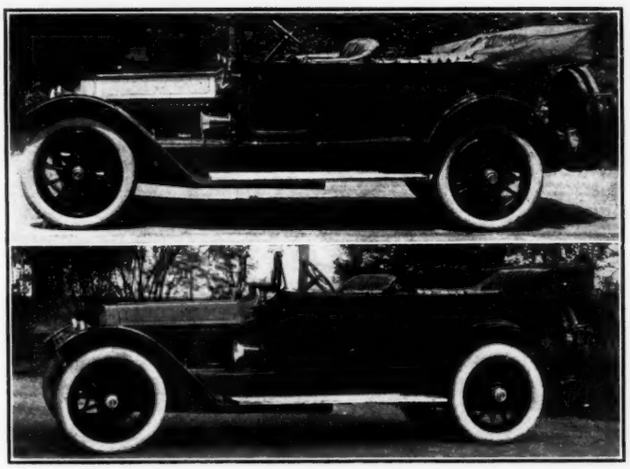
The little six is 4.25 by 5 inches. The big six motors are 4.5 by 5.5 inches. The S.A.E. horsepower of the small six is 43.35. The S.A.E. horsepower of the big six is 48.6. The actual horsepowers of the two motors are respectively 63 and 82. These ratings are calculated at a crankshaft speed of 1,800 revolutions per minute.

Both Sixes Have Seven-Bearing Crankshafts

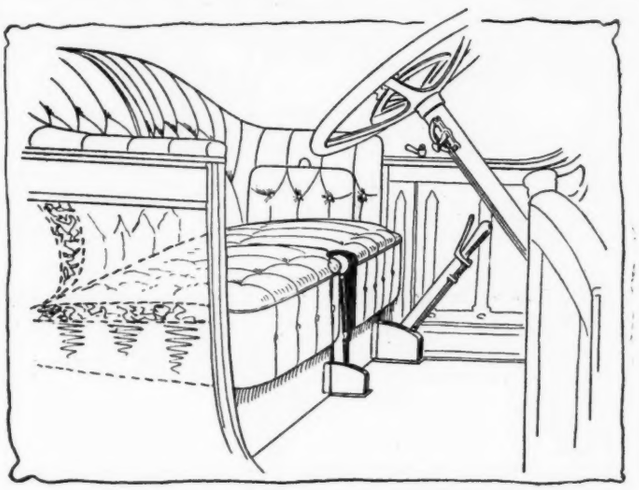
Connecting-rods for the little six are 11 inches in length and 12 inches for the big six. They are composed of chrome nickel-steel. The crank bearing on both sixes connecting rod is 2 inches in length. Both engines have seven-bearing crankshafts. The bearings located between the cylinder castings are longer than those located between cylinders in the same block. On the big six the length of the bearings between the cylinder blocks is 2 5/16 inches and the bearings between cylinders in the same block are 1 11/16 inches. The material used in the crankshaft is chrome nickel-steel and the bearings are all lined with Parsons white metal.

The drive of the valve mechanism is taken from a spiral gear-set, located in a case at the front end of the motor, through a camshaft which has the cams cut integrally. The cams act directly on roller followers which transmit the motion to the pushrods. The latter are carried in exceptionally long guides which provide a means of checking oil leaks and give a rigidity to this mechanism. The valve mechanism is not inclosed, but silence is secured by close work in the valve parts. The cold clearance between the bottom of the valve stem and the push rod is .004 inch. This is taken up when the motor becomes warm. The grinding limit on the spiral gears which drive the valve action is .00025 inch.

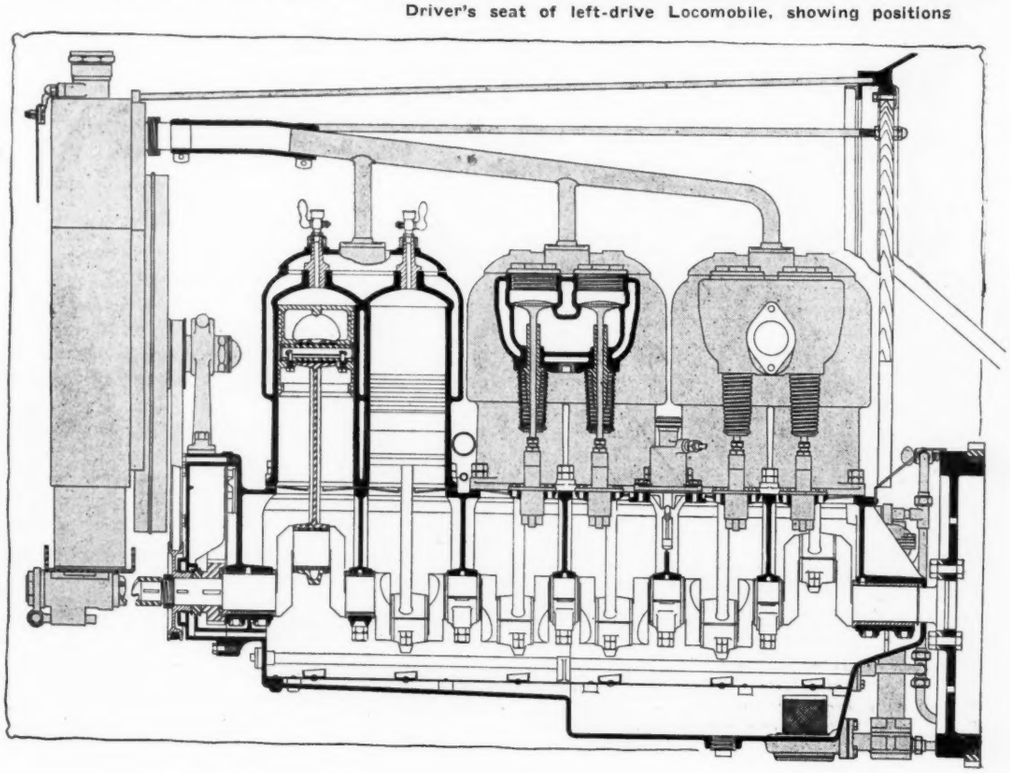
The cooling system is operated by a centrifugal pump located on the exhaust side of the motor near the forward end. This takes the water from the radiator and forces it through a long manifold which is lifted above the generator and pumpshaft. The radiator is a cellular design and is further cooled by means of a six-blade aluminum fan mounted on a bracket fixed to the timing gear case.



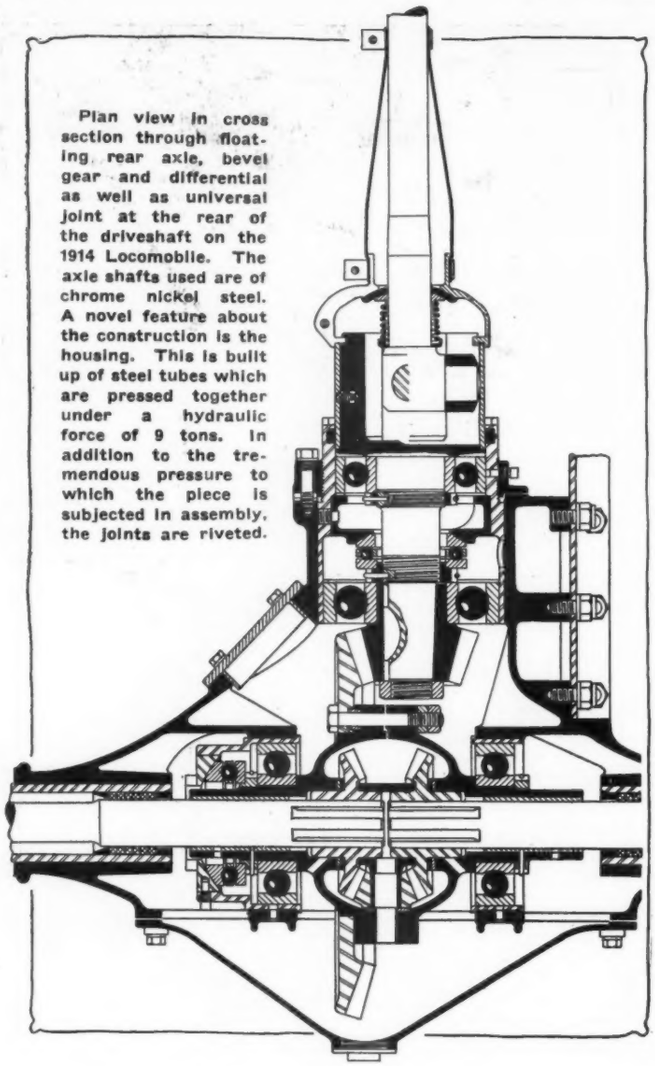
Top, little six touring car with left drive. Below is shown a torpedo body mounted on a little six chassis with left-side drive



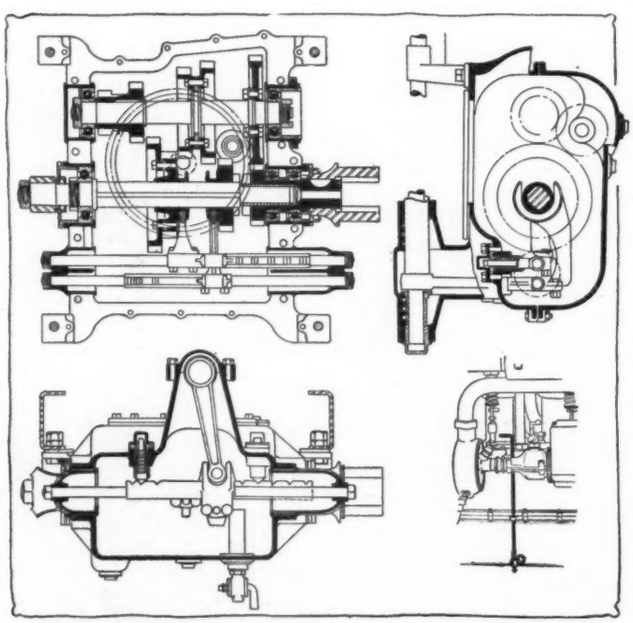
Driver's seat of left-drive Locomobile, showing positions



View of the 1914 six-cylinder Locomobile motor, showing the partial section entirely through the front pair of cylinders and a section of the valve chambers in a second pair of cylinders. Both the big six and the little six have seven-bearing crankshafts. The crank bearing on the connecting-rods of both sixes is 2 inches in length. On the big six the length of the bearings between the cylinder blocks is 2.94 inches, while on the little six this dimension is 1.69. The material used in all crankshafts is chrome nickel steel, the bearings all being lined with Parsons white metal



Plan view in cross section through floating rear axle, bevel gear and differential as well as universal joint at the rear of the driveshaft on the 1914 Locomobile. The axle shafts used are of chrome nickel steel. A novel feature about the construction is the housing. This is built up of steel tubes which are pressed together under a hydraulic force of 9 tons. In addition to the tremendous pressure to which the piece is subjected in assembly, the joints are riveted.



Three views of the four-speed gearbox used in all 1914 Locomobile cars. At the right lower corner of the illustration is a sketch of the operating device for the crankcase oil drain. Turning the little lever drains the oil to any desired level

The electrical equipment of the car consists of three machine units and two independent storage batteries. The three electrical units are the magneto, for ignition, the generator for charging the storage battery and operating the lighting system, and the electric motor for cranking the engine. One of the storage batteries is used for ignition and the other is used in connection with the lighting and cranking system. By the use of the magneto and the three-cell 6-volt storage battery a dual ignition system is provided. The generator is driven off the pumpshaft and operates at 6 volts. The cranking motor is geared to the flywheel and is in engagement only in starting the engine. Depressing a pedal puts the cranking motor in engagement and at the same time starts it spinning the engine. The starting and lighting battery is of Willard manufacture and has a capacity of 120 ampere-hours. The oiling system is a force feed which takes the oil from the reservoir in the crankcase and by means of a gear pump forces it in a steady stream to the motor bearings. A new feature of the oiling system is an accessible oil drain which can be reached by simply raising the bonnet. By its use the oil can be drained to any desired level and does away with the necessity of crawling beneath the car to reach the drain cocks.

All-Steel Multiple Disk Clutch

The clutch used on all models is an all-steel multiple disk. It has 43 saw steel blades housed within the flywheel. This type of clutch runs in oil and the manufacturers use and recommend engine oil and kerosene in equal parts. The clutch disk retainer is carried on a double row of ball bearings at the motor end and a single row of ball bearings at the rear end. The entire clutch is removable from the car without interfering with the gearbox or any other part of the car. This is a feature which materially aids in cutting down repair bills on this part of the car. Back of the clutch, between it and the gearset, is a universal joint.

The Locomobile gearset provides four forward speeds and a reverse. The reductions between motor and rear wheels are respectively as follows:

Gear Reduction, Motor to Wheels

Fourth speed	3.54 to 1	(direct)
Third speed	4.95 to 1	
Second speed	6.79 to 1	
First speed	14.15 to 1	
Reverse	20 to 1	

The total amount of lost motion in the entire gearset is limited in manufacture to .001 inch. This is accomplished in limiting the tolerances on the gear work to within .00025 inch. The gearset shafts are carried on ball bearings and run in a light gear grease. The capacity of the gearbox is 20.5 pounds of grease. The gearbox is bronze.

Driveshaft Is Not Inclosed

The driveshaft has a universal joint at each end and is not inclosed, as the torque and distance functions are taken care of by a pressed steel tapered channel torque beam and a pair of radius rods. The pressed steel torque channel beam is lightened materially without altering its rigidity to any extent, by having lightening holes cut in the web of the channel. The radius rods are steel castings, flexibly bracketed to the frame. With this combination of torque and radius members the springs are free. They have no other duty than to support the weight of the car and to neutralize the irregularities of the road.

A floating rear axle transmits the drive from the shaft to the rear wheels. The bevel type of drive is employed and the axle shafts are of chrome-nickel steel. The axle housing which supports the weight of the car is of interesting construction. It is built up of steel tubes which are pressed together under a hydraulic force of 9 tons. In addition to the intense pressure used in the assembly the joints are riveted.

Wood artillery wheels are used and both sets of brakes act upon drums carried by the rear wheels. The internal expanding brake set has an effective braking surface 14 inches in diameter

and 2 inches in width. The external contracting brake dimensions are 14.4375 inches diameter by 3 inches face width. The brake adjustments are made by right and left threaded nuts on the emergency set and by winged nuts on the service brakes. The brakes act through an equalizing bar mounted transversely across the frame and braking strains are all taken through the radius rods.

Heavy Dowel Pins Used

A solid I-beam front axle is used. It is drop-forged from a one-piece nickel-steel bar having a tensile strength of 87,000 pounds to the square inch. The spring pads are forged integrally with the axle and are featured by the heavy dowel pin passing through the center of the front spring. This pin takes the drive from the springs and transmits it to the front wheels. It also takes the steering strains.

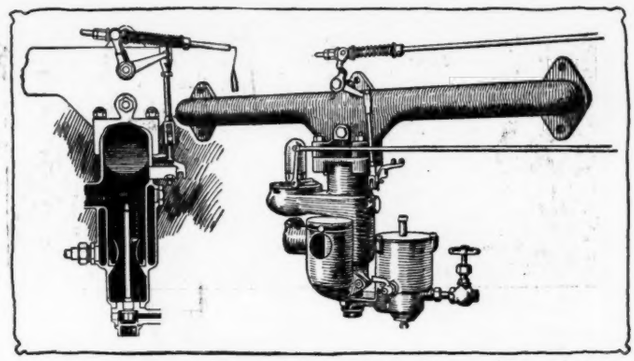
Timken roller bearings are used for the front wheels and roller bearings are also used on the steering gear, which is of the worm and gear type. It is a feature of this steering gear that six adjustments for wear between the worm and nut are provided by simply removing the steering lever and turning a hexagonal nut, bringing a new sector of the gear in mesh with the worm. The worm and gear are both case-hardened.

Several Silence Features

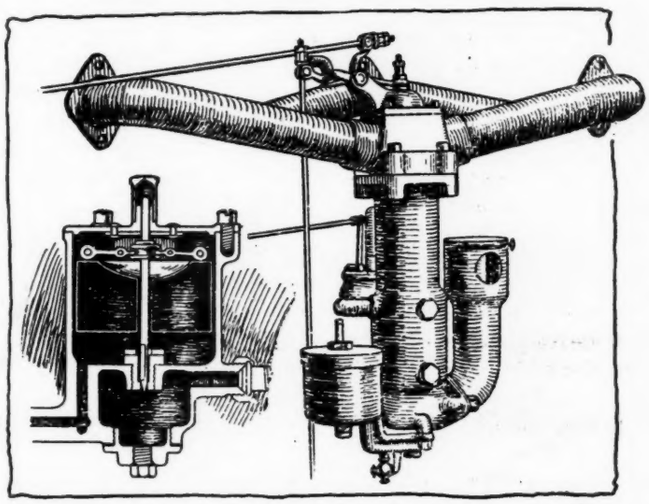
Throughout the car several silence features are noticeable. The cast aluminum cowl is a unit with the dash being bolted to the body sills. A layer of woven cotton belting material is inserted between the body and the frame, preventing body squeaks. The doors close against blocks of solid rubber, which silences the noise of closing and prevents rattles. The tire brackets are in the rear and are solidly connected to the frame. They are of drop-forged material and cannot possibly rattle. The lamps, license brackets, etc., are all solidly connected to the car in such a manner that they cannot possibly work loose.

Single-Cylinder Air Compressor

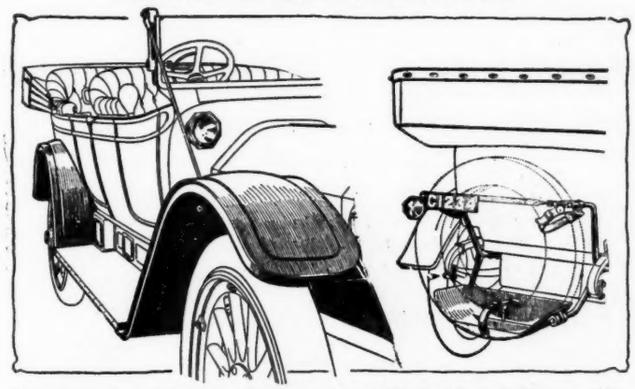
Many conveniences will be found on the car in the line of modern accessories. Chief among these is a single cylinder air compressor, by means of which the 37 by 5-inch tires can be inflated to 90 pounds in about 2 minutes. This air compressor has a bore of 2.5 inches and a stroke of the same length. It is mounted on an extension of the front end of the gearset countershaft and driven through a jaw clutch which can be engaged or disengaged by a T-shaped handle located on the left side of the car through a small door in the side of the running-board shield. The handle is drawn outward about 3-16 inch and advanced one notch to the left. This engages the jaw clutch and the pump is ready for use. The air is drawn in through holes drilled around the bottom of the cylinder of the pump, and on the up stroke of the piston the air is forced out of the cylinder by lifting a flat valve. This allows the air to pass into a small tank to overcome the pulsations of the pump, and from there it passes on to the tires. The pump is so arranged that nothing but pure air can reach the tires.



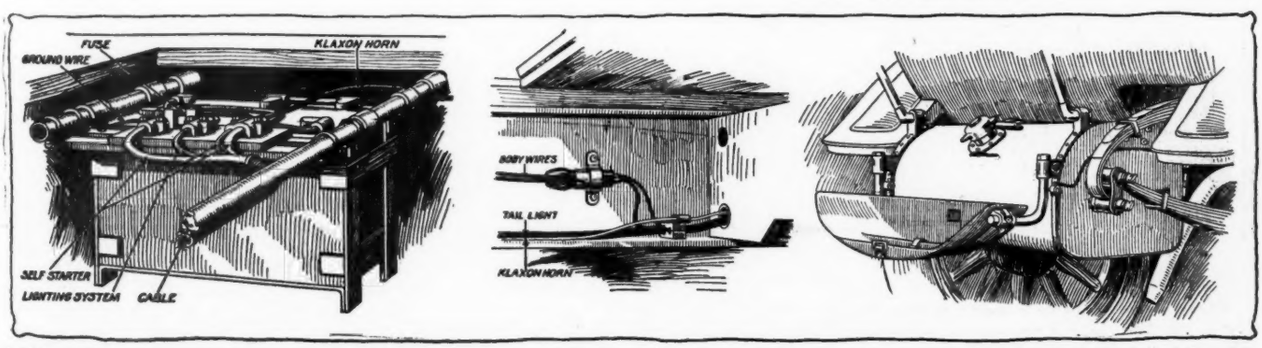
External view and section through carbureter, showing straight intake manifold used on left-drive models



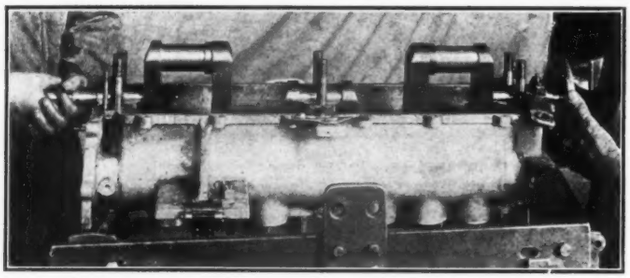
Sectional view of carbureter, showing needle valve construction, also V-manifold used on right-drive types



At left, curved rivetless fenders. At right, locking device on tire brackets at rear



Left, wiring arrangement for storage battery. Center, switch for connecting wiring on closed cars. Right, protected position for fuel tank at rear of left-drive cars. Right-drive cars use gravity feed



The Rostrum

Thinks Moisture in Atmosphere Has No Effect on Motor

EDITOR THE AUTOMOBILE:—I have read with a great deal of interest your reply to the inquiry of S. M. S. in the issue for October 23 as to the effect of water vapor upon the running of the gasoline engine.

As the wording of your reply, together with the accompanying sketches showing method of attaching a water tank to dashboard and of piping the water to the intake manifold, amounts to an editorial statement to the effect that the power obtainable from a gasoline engine may be increased by the addition of water, I think some experimental data should be published on this subject.

As water is incombustible in the ordinary sense and, owing to its high latent heat of evaporation, can act in the combustible charge only as a powerful endothermic agent, it cannot by any possibility add to the number of heat units set free within the cylinder.

It is true that in the case of an engine having compression so high as to induce pre-ignition the addition of water to the charge will keep down the maximum temperature of compression and perhaps permit more power to be developed by a defective engine that will not carry its full load quietly when supplied with gasoline and air alone, but the addition of water must always be accompanied by a considerable sacrifice in fuel efficiency.

Years ago, when the gasoline engine was in its infancy and when pre-ignition was the great bugaboo, it was not uncommon to attach a water carbureter arranged to come into action when the load approached the capacity of the engine. I had very intimate dealings with a number of such engines and can testify from repeated tests that the addition of water to the combustible mixture to cause the engine to run quietly at full load resulted in a pronounced increase in the fuel consumption per horsepower developed.

The belief held by some drivers that their engines develop more power than usual on damp, foggy nights is doubtless akin to the illusion, that was at one time common, that the automobile would run much faster just after sunset, which illusion was gradually dispelled as speedometers became common.

Plainfield, N. J. S. W. RUSHMORE.

Wire Wheels 50 Per Cent. at Paris Shows Growing Popularity Abroad

Editor THE AUTOMOBILE:—The accompanying table shows the exact status of different types of wire, steel, disk, and wood wheels at the Paris Salon. This shows 447 cars fitted with wire wheels out of 801. There were 309 fitted with wood wheels, almost 130 fewer than with wire ones. This is a remarkable showing in view of the attitude a few years ago when the French makers refused to use wire wheels.

It is a fact that most of the small cars are fitting wire wheels in place of the wooden type. One of the reasons for the growth and numbers of the wire wheels is the scarcity of hickory, which has been increasing for some time.

Types	Car Makers	Body Builders	Total
Rudge-Whitworth detachable wire wheels	85	48	133
Rudge-Whitworth wood wheels	4	..	4
Dunlop detachable wire wheels	79	43	122
Dunlop fixed wheels	2	..	2
Riley detachable wire wheels	19	2	21
Other detachable wire wheels	56	13	69
Fixed wire wheels	84	12	96
Steel detachable wheels	27	4	31
Disk wheels	4	0	4
Fixed wood wheels	91	170	261
Detachable wood wheels	18	5	23
Detachable wood rims	35	..	35
Total	504	297	801

Wire wheels	447	Detachable wheels	408
Steel wheels	31	Detachable rims	38
Wood wheels	319	Fixed wheels	355
Disk wheels	4		801
	801		

Coventry, England. JOHN PUGH.

Rectifier Used for Plating Purposes In Connection with Three Cells

Editor THE AUTOMOBILE:—1—Kindly advise if an air starter may be successfully used on a four-cylinder, 33-horsepower, 4-inch bore and 4.5-inch stroke?

2—Advise if a type G Westinghouse vibrator rectifier may be used for nickel-plating purposes.

3—In looking over THE AUTOMOBILE for October 16 I note Fig. 2, method of wiring Ford lights to include the battery. Is the magneto of the flywheel type?

Geneva, N. Y. J. W. THOMSON.

—1—An air starter can be successfully used on the motor you mention, but it would be an expensive proposition to install such an outfit after the car is built. An air starter, owing to the manner of its construction, should be built upon a motor that has been designed to take it. When this is not done the job is either very expensive or a misfit results, and for this reason where a starter is applied afterwards it is hardly ever of the air type, although the air type of starter is in itself highly successful.

2—The type G Westinghouse vibrator rectifier is primarily intended to charge vehicle batteries and cannot alone be used for nickel-plating purposes. By connecting up three lead cells in parallel with the rectifier it will be given the proper polarity and will satisfactorily do the work. When this is done the rectifier will be carrying the load, but the dry cells are nevertheless necessary for the polarity purposes.

3—In THE AUTOMOBILE for October 16 the illustration you

refer to is a diagramatic representation of the Ford lighting system when using the flywheel magneto.

Interested in Cyclecar Design

Editor THE AUTOMOBILE:—I am interested in the design of a cyclecar, but find there are a number of things on which no data are obtainable.

1—Can you give me any idea of a drive from a two-speed and reverse change speed set to the rear axle, some kind of simplified differential? Is there any means of getting away from a chain or belt drive and still maintain simplicity?

2—Is it true that a great many cyclecars are designed without change speed sets of any description and depend on the throttle for variation in speed?

3—Can you tell me what is the greatest weight a cyclecar may have to be supported under average road conditions on ordinary motorcycle wheels and tires?

4—I would also like to have some idea in formula, if possible, in terms of bore and stroke, of the proper length connecting-rod for a four-cycle vertical gasoline engine.

Williamsport, Pa. W. H. S.

—1—There are several ways that you might use a shaft drive without employing a differential. It is doubtful, however, whether any of these will appeal to you. Drive through one rear wheel has been used to some extent, but with this construction the tire that does the driving wears out more quickly, and then there is a greater tendency for the car to skid when on wet roads, as the unbalanced driving force tends to rotate the car about its center. If a one wheel drive is to be used it would be better to place that wheel right in the center and construct a tri-car.

By connecting the wheels to the axle shafts by ratchet clutches a fairly satisfactory differential action can be obtained. In turning a corner the drive is through the outer wheel alone, the inner axle shaft over-running its wheel.

—2—THE AUTOMOBILE knows of no cyclecar without some form of speed changing set. It would be possible to build a car without such a device, although it would not be as satisfactory, everything considered, as those with speed-changing sets. An extra large motor or a much lower gearing would be required on the car you suggest, but even then it would not have the necessary mechanical advantage that would be needed for very heavy roads or steep hills. If a larger motor were used it would add cost and weight that would more than compensate for the elimination of the change-speed device. A larger motor would also be less economical. On the other hand, if you employed a motor of the same size the maximum speed of the car would be reduced, and at ordinary rates of travel the increased motor speed would decrease its life.

—3—One hundred and fifty pounds per wheel is about the maximum.

—4—Make the connecting-rod twice the length of the stroke

Explains Torque Arm Action

Editor THE AUTOMOBILE:—In your issue of October 23 you give an explanation of the action of the torque arm, in answer to a query signed by R. T. C.

This explanation seems to indicate that the pull on the torque arm is downward while the car is traveling forward, due to the tendency of the axle shaft to drag the housing with it. Although there is such a tendency, I believe that it is more than counteracted by the upward pull, due to the climbing action of the pinion on the bevel. The resultant force is an upward pull on the torque arm while the car is moving forward, without the brakes being applied.

Detroit, Mich. W. T. HUNT.

Club Acts as Poster of Roads

Editor THE AUTOMOBILE:—During the past season the Sign Board Committee of the Automobile Club of Hartford has erected approximately 300 signboards. Every road radiating

Fig. 1—Plain road sign erected by Automobile Club of Hartford

from Hartford has been posted. Roads as far east as Willimantic have been cared for, also the road from Willimantic to New London and Norwich north to the state line and west to Winsted.

As matters now stand all the main roads have been posted. Next season the back trails and connecting roads will be marked. The work will be started as soon as permissible. The signs used are white background with large black letters with the direction noted by red arrows. The posts are also painted white. "Look for the White Sign" has become the club slogan. The club has passed out considerable information to visiting motorists this season on road conditions. The traffic police when asked for directions refer the questioners to the club for such information as they do not possess. In this way the road department of the club has become much better known. The visitors after calling on the secretary have gone their various ways with a decidedly good impression. The Automobile Club of Hartford while not as active in some channels as in the past is doing more good work for the general cause than ever before. The organization is now being conducted on a business basis.

Hartford, Conn. W. J. JOHNSON.

Adjustment of Haynes Clutch

Editor THE AUTOMOBILE:—Will you please explain the adjustment of the Haynes clutch? 2. What preparation do you

Fig. 2—A dangerous curve that has been widened for safety's sake

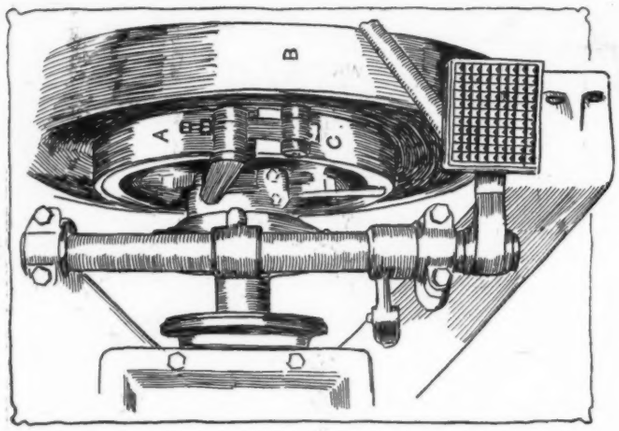


Fig. 3—Showing the adjustment features of the Haynes contracting clutch

recommend for lubricating the clutch surface? I am using a mixture of flake graphite and oil at present.

Galveston, Tex. H. F. B.

—1—The Haynes clutch is illustrated in Fig. 3; the adjusting screw is shown at A while B is a locknut for this screw. If the clutch slips tighten the band C by screwing up on the nut A after loosening the locknut B.

2—The Haynes Co. recommends a mixture of powdered graphite and oil for the friction surfaces of the clutch, although if the powdered variety is not obtainable flake graphite will do very well. The graphite should be mixed with enough cylinder oil to form a creamy paste.

Suggests Six-Cylinder Crankshaft Design

Editor THE AUTOMOBILE:—I herewith send you a sketch of a six-cylinder crankshaft which I am about to design in this particular way for a special reason. (Cranks set at 120 degrees.) I would like to know if any of your readers are in touch with anyone who has had some experience with a shaft of this design?

It seems feasible to balance a three-cylinder, two-cycle shaft with cranks at 120 degrees, and for my part I cannot see why a six-cylinder, four-cycle shaft of this design could not be properly balanced.

My design, Fig. 6, is that of a small motor with light reciprocating parts.

Detroit, Mich. W. J. LATOURRETTE.

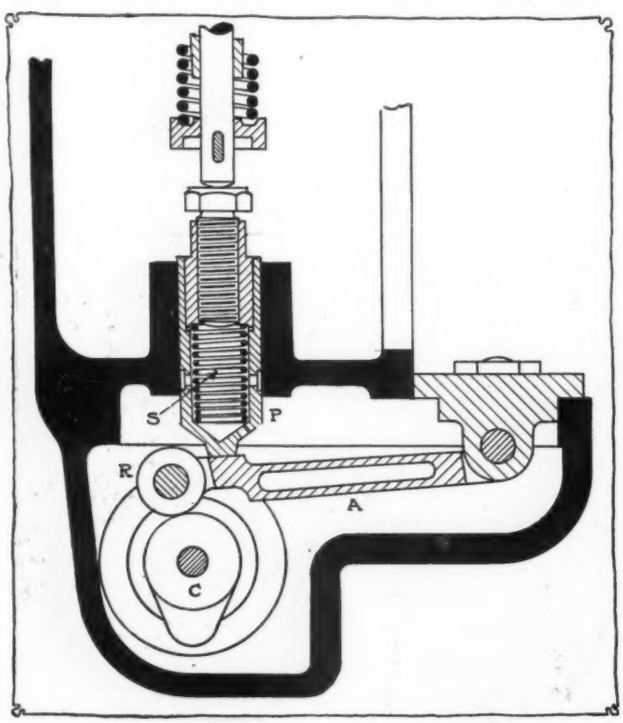


Fig. 4—Valve action used on Sheffield-Simplex car

New Carbureter Water Connection

Editor THE AUTOMOBILE:—I read with interest your article in THE AUTOMOBILE for October 23 on a device for feeding water in the intake manifold.

The sketch, Fig. 5, shows a way of connecting up such a device so that if the water is not turned off when the motor is stopped no harm will be done.

The air pipe of the carbureter is bent as shown so that the end of it points downward and the water pipe is connected near the end of the air pipe. By connecting it in this manner water can be fed into the cylinders only when the motor is running.

I have used a device of this kind with success on a stationary engine using kerosene as fuel.

Ithaca, N. Y. R. A. FREAR.

Valve Action of the Sheffield-Simplex

Editor THE AUTOMOBILE:—I am running a Sheffield-Simplex car and would like to know whether any clearance is supposed to be left between the end of the valve stem and the push rod? When I attempt to loosen the adjustment to leave a little clearance at this point there is a spring somewhere in the mechanism which takes up the clearance. Will you kindly explain how this valve action operates?

Boston, Mass. JAS. WALKER.

—The valve mechanism of the Sheffield-Simplex is shown in Fig. 4. It consists of a rocker arm working on a pivot carried in the side of the crankcase. At the end of the rocker arm is the cam follower which is in the form of a roller. As the cam rotates the rocker arm with the roller is carried up and down and the push rod is lifted according to the time of the cam action. The push rod transmits the motion through the tappet to the valve stem by means of a shoulder on the inside of the hollow push rod. In this hollow push rod a spring is inclosed and the clearance to allow for the expansion of the valve mechanism due to the heat of the engine is between the shoulder of the push rod and the tappet mechanism. That is, instead of having the clearance between the adjusting nut and the end of the valve stem it is within the push rod guide and therefore the slight tap made by the closing of this clearance space is inaudible. The adjusting nut is always held tightly against the bottom of the valve stem by the coil spring.

Some Differential Ideas Evolved

Editor THE AUTOMOBILE:—Having thought a little about the fault of the differential, I was interested in the description of the M. & S. differential on page 537 of THE AUTOMOBILE for September 18, and I suppose it would be permissible to indulge in a little friendly criticism in pointing out that some points are not quite clear. The statements, "drives through the wheel of greatest resistance" and "instead of driving the wheel having the least traction, that having the greatest is given the more power," if the word traction has reference to the travel of the wheel on the ground, are somewhat contradictory. On a turn the inner wheel has the greater power or resistance to balance the further travel of the outer wheel, when both are driven from the same power, as explained in a former communication.

In an ordinary differential the power is applied through the compensating wheels of the differential. In the M. & S. the power is applied through the spirals B, only the compensating power goes through the wheels C. On a straight course the spirals do not turn on their axis, and the road wheels and wheel C, Fig. 7, turn in unison. But on a right-hand turn the right road wheel goes slower than wheel C and the left wheel faster

than C, and the spirals B and wheels C would turn on their axis to accommodate the further travel of the outside wheel.

Taking the middle figure of the illustration, the right spiral, the side facing the reader would turn from the reader's left to his right, sliding on the diagonal teeth of wheel A, would cause it to lose motion, the spiral B having a sort of downhill slide, would revolve wheel C by a sliding contact, which in turn would revolve the left spiral B to increase the travel of the left-hand road wheel, but this left-hand spiral would turn from the reader's right to his left, just opposite to the action of the other spiral. On the application of power, if it were not for the compensating power of the wheels C, the spirals B would spin around, being carried by the differential housing, the motion being lost in the diagonal teeth of wheel A like a nut on a bolt while the road wheels remain stationary. How then can the further-traveling left road wheel have more power applied to it when the further or uphill travel of the left-hand spiral is obtained from the compensated power of the right road wheel?

The M. & S. has five elements in operation of compensation to the common differential three. Furthermore, in the common design the transfer is made at right angles. In the M. & S. it is transferred in a diagonal line. This and the increased number of transfers, one would think, would be equal to a loss of leverage, cause a loss of power, or less sensitive in compensation. By the same reasoning, how could the statement be carried out, "That if one wheel was jacked up and power applied, the jacked-up wheel would remain stationary, while the other wheel would pull it off the jack?" If the left wheel was jacked up where would the compensating wheel C get the power to revolve the right-hand spiral B to drive the right road wheel faster than the wheel, the spirals B and wheels C being firmly journaled in the differential housing and all revolving together, remembering the downhill tendency to slide of the right-hand spiral B on wheel A?

What has the compensating wheel C to back against to counteract this sliding tendency? If the left-hand wheel would revolve one would think the stiffness of the differential enabled the wheel to pull off the jack. But the ability of the jacked-up wheel to remain stationary is a mystery that needs elucidation.

After some reflection on the differential problem, it seems to me about the simplest solution is a four-wheel drive, the rear wheels with its usual differential, the front wheels only a forward drive, and that by ratchet drive, this would require pivot steering wheels, and after a little thought it does not appear to be such a formidable accomplishment. But to judge by the way cars slid around at a fair recently, in a low country, after a heavy rain, it would be a very desirable construction and could not come too soon.

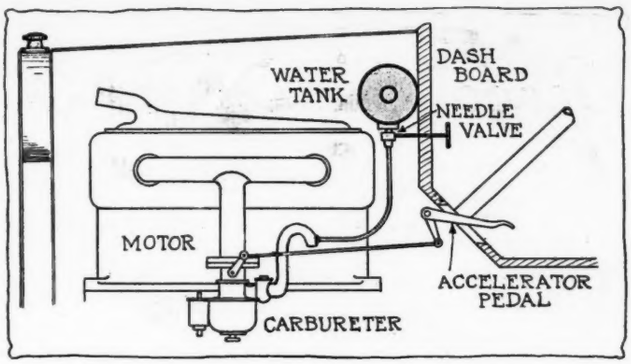


Fig. 5—Carbureter water connection suggested by reader

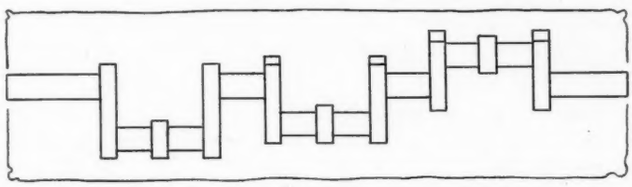


Fig. 6—Six-cylinder crankshaft designed by reader

The many efforts to solve this problem may finally bring a simple solution of it, as often simple things are overlooked for quite a while. For instance, I have noticed a method to start a motor after it had been standing quite a while on a cool night. As I do not remember of seeing this method in print, I will give it for the benefit of the hand crankers.

Turn the crank over a couple of times. This fills the cylinders with gas, then churn the motor, that is, turn the piston up as close to the top dead center as it will go and readily spring back. Do this eight or ten times, then throw it over and away it goes. The explanation is compressing the air develops the heat.

Bradenville, Pa. Jos. MUNDEN.

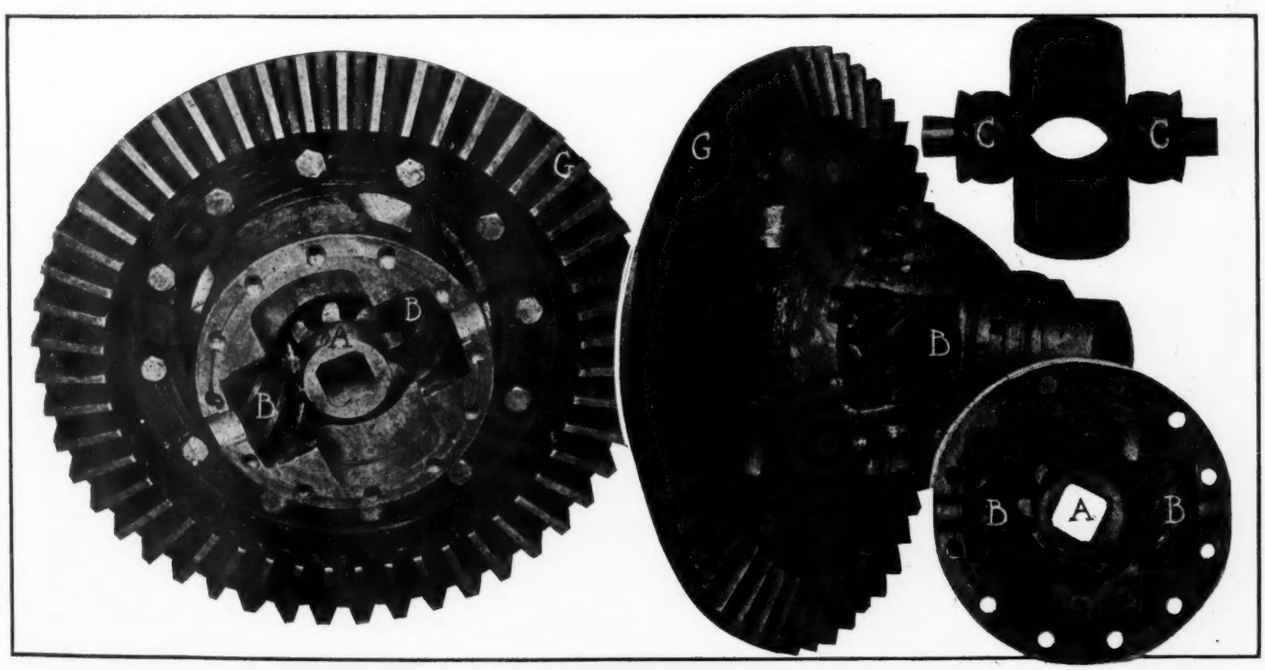


Fig. 7—Gears and worms used in the new M. & S. differential, spiral teeth cut at 45 degrees taking place of double pinion

Deaco Starter Is Made in Three Types

Compact Tandem Design in Which Generator and Motor Are Mounted Together Is Company's Latest Product

ADAPTABILTY is a highly important consideration for the designer of electric cranking motors. This is so because of the wide differences in the spaces around the various makes of engines and the possible methods of applying the cranking motor. The geared motor applied directly to the flywheel is the type growing most rapidly in favor, but the starter field still includes many types in which the drive between the motor and the engine crankshaft is by chain or gear and worm combination.

To provide for this variety of mechanical situations the Deaco cranking motors are made in three types. Model C, adapted for chain or other drive not directly on flywheel, is a cylindrical machine provided with a large end cover at the driving end in which a reduction gear is totally inclosed. Model GF, a section through which is shown in Fig. 1 is arranged for direct application to the toothed flywheel by means of a sliding pinion. The third type of Deaco cranking motor, Fig. 2, is a tandem unit in which a cylindrical generator of similar design to the motor is mounted alongside on the same double endplate, forming a compact device which can be fitted to the engine as shown in Fig. 3

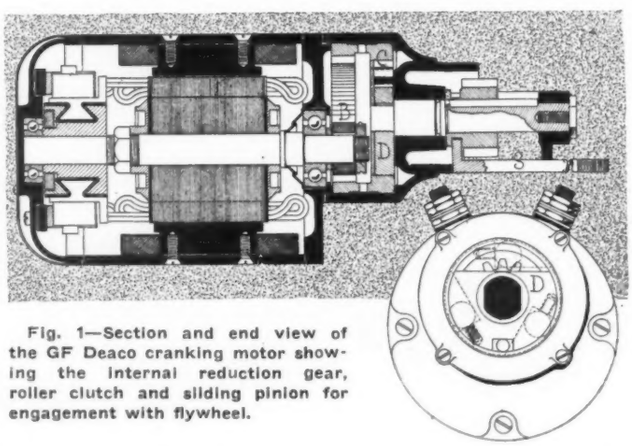


Fig. 1—Section and end view of the GF Deaco cranking motor showing the internal reduction gear, roller clutch and sliding pinion for engagement with flywheel.

In the GF starter, Fig. 1, the reduction from the armature shaft to the starting pinion is by a pinion and internal gear, B. The outer end of this latter part transmits its motion to the final pinion through an over-running clutch, C. By this means it is impossible for the engine to spin the motor at a dangerous speed should the sliding pinion be not withdrawn immediately the engine picks up. The construction of this over-running clutch is shown in the end view in the same illustration. The driven member of the clutch is a hardened steel piece D containing recesses which accommodate the three steel rollers through which the drive is transmitted. In the working position light steel springs insure that the rollers maintain a constant contact with the inner surface of the outer member of the clutch and the faces of the recesses in D. This renders slip impossible when starting the motor, so that the clutch acts immediately. This type of clutch is general practice on starting motors. Great accuracy is necessary in their manufacture to obtain the desired quick grip on starting and at the same time a free running in the opposite direction.

As regards dimensions the Baby Giant, as the Type GF is called, measures 5.5 inches diameter by 7.25 inches long, this latter dimension excluding the casing containing the reduction gearing. The weight is only 29 pounds. A gear ratio in the neighborhood of 18 to 1 is usually employed, the reduction gear in the motor casing being 2 to 1, and the flywheel-sliding pinion ratio about 9 to 1.

Operation of the starter is by a small pedal conveniently arranged on the foot board. This is in connection with the shifter rods extending from the sliding pinion case. Through interconnection the same movement of the pedal operates the starting switch, applying the current gently at first through the insertion of a ribbon resistance and finally connecting direct by cutting out the resistance. This precautionary measure permits easy meshing of the gears, the full power of the motor not being applied until the teeth are in full engagement.

The tandem machine, Fig. 2, is designed to meet the demand for compactness and ease of fitting. There are no differences in the construction of the two units, regarded as separate machines. The new arrangement is merely a coupling of the generator and starter on the same end cover, which is a single cast steel casing containing the reduction gear and over-run-

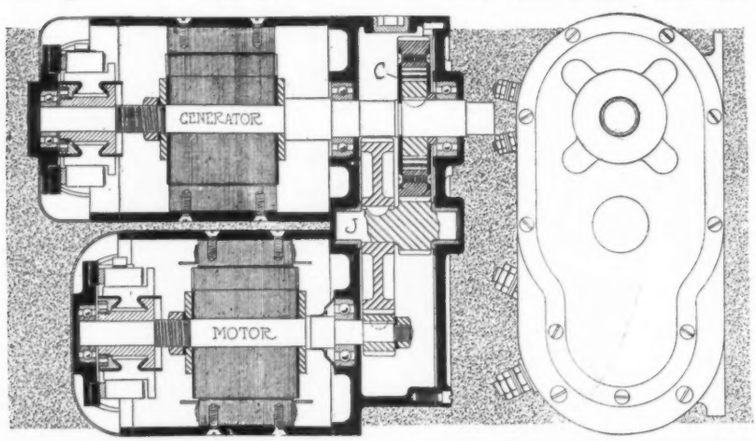


Fig. 2—The new tandem design in which the generator and motor are mounted on a common base. End cover incloses reduction gear and roller clutch

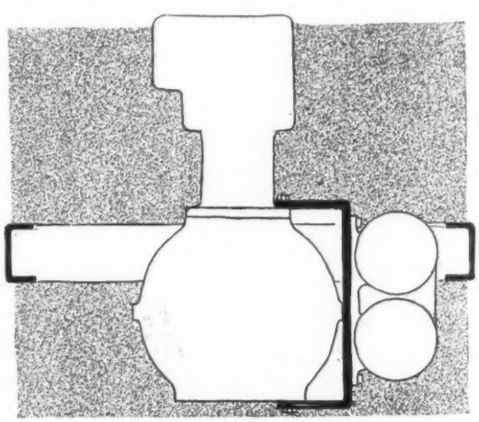


Fig. 3—Diagram showing one method of applying the Deaco tandem set to side of engine crankcase

ning clutch. An important advantage resulting from this arrangement is that a more sturdy type of reduction gear can be used. The over-running clutch C is mounted on the armature shaft shaft of the generator, and a double reduction takes place between it and the pinion on the motor shaft. The intermediate gear is mounted on a short shaft, J, situated midway between the two armature shafts, on bronze bushed bearings in the end covers. A gear reduction of 18 to 1 is the standard ratio between motor and flywheel.

Turning now to the construction of the motors, this follows the same lines in all Deaco types. They are of the four-pole series wound type. Flat wire is used for the armature winding in plain slots. An ingenious machine specially designed for these motors is used for forming the armature windings. By its use a coil can be formed in a few seconds with a single movement of a lever. A point of considerable importance from the point of view of permanence of connection is that all the connections between the field coils are soldered, and as in addition, the pole pieces are provided with lips, no possible loosening can take place inside the casing.

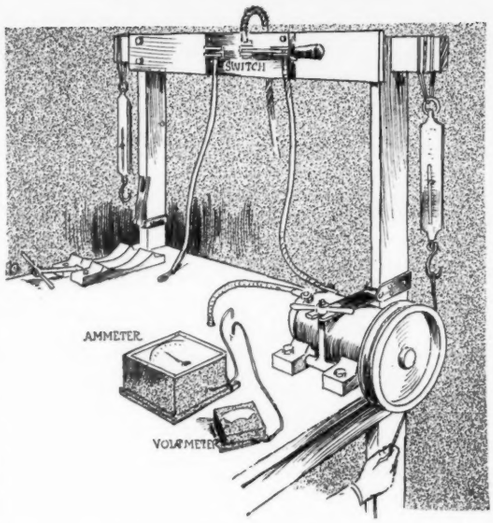


Fig. 4—Test bench showing motor under brake test

Steel binding wires are used on the armature so that the winding remains firmly in the slots. A fiber brushholder disk is mounted on the inside of the end cover and to this the die-cast brushholders are attached. By this construction the whole end cover can be removed for inspection purposes.

Generator Control by Third Brush

The four-pole field type is also adopted for the generator, either of the tandem set or the separate machine, but instead of four brushes, three are used, two being the main brushes and the third, inserted in the field circuit, acting as a controller of the output on the high speeds. This results from an electrical effect by which on speeds higher than normal the magnetic field in the armature is distorted in such a way that the supply of current passing through the field winding from the auxiliary brush is diminished, thereby keeping the generating power of the machine at a fixed maximum.

There are no secondary coils on the fields, the winding being plain shunt. Charging of the battery commences when the automobile is traveling at the rate of 6 to 8 miles per hour and the maximum output is 15 amperes.

Fig. 5 shows the complete wiring of the Deaco system including lighting and starting.

Before dispatching, every motor undergoes a thorough test both mechanical and electrical. Fig. 4 shows the test bench used for this purpose. Two cradles that fit the curvature of the magnet casing are mounted on the bench at the base of two corner uprights, forming a quick method of fixing down the motor by means of clamps and thumbscrews. A change-over switch on the cross-piece at the top is in direct communication with a large 6-volt generator and from the contact bases of this switch flexible wires depend for attachment to the terminals of the motor under test. On clamping to the bench and connecting up, a steel pulley of known diameter is slipped on to the end of the armature shaft. A cord attached to spring balance suspended immediately overhead is the means of applying the brake test as shown in the illustration.

Motors Are Tested for Insulation

Before the load test, however, two electrical tests are made. First, a voltage of 220 is applied to both armature and field windings. If no breakdown occurs the insulation is sound. Then a free running test is made in which the motor is allowed to take 40 amperes and run at a speed of 7000 revolutions per minute. Any weakness to the binding wires on the armature would be discovered by this exceptionally high speed, the centrifugal action of the windings being considerable.

The third and final test is one in which careful readings are taken of the torque in foot pounds at various speeds and current consumption. In taking the readings the cord mentioned above is given a turn around the pulley and a pull applied by hand as shown. Six readings are taken from each motor tested and all of these must exceed the low limit on a curve kept for this purpose, before finally passing. The torque is read from the spring balance and the efficiency is obtained. A curve sheet plotted from tests on a Baby Giant motor of the type shown in Fig. 1 is given in Fig. 6.

In this the volts, amperes, speed and efficiency are plotted with respect to the torque in foot pounds. It will be noticed that the maximum torque exerted is 18 foot pounds at which point the battery voltage has dropped slightly over 1 volt. The efficiency is well maintained throughout the useful speed range.

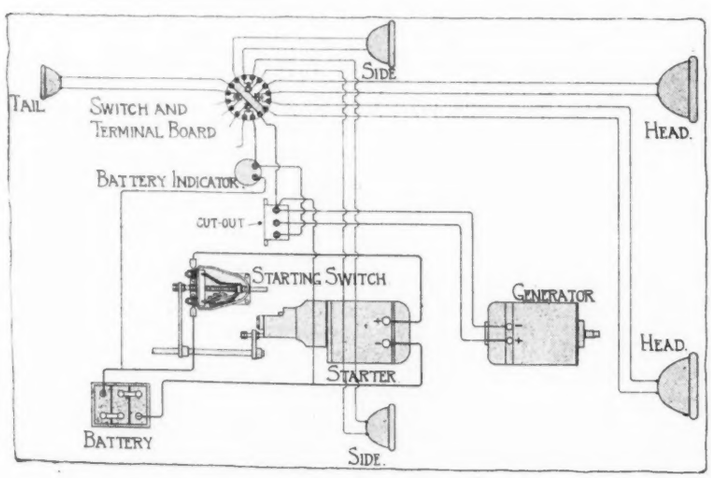


Fig. 5—Diagram of connections of Deaco starting and lighting system

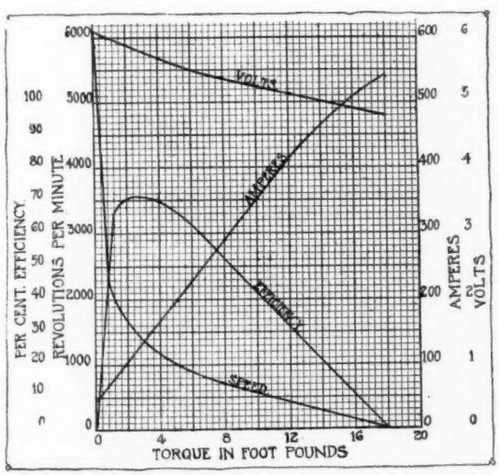


Fig. 6—Curves obtained from test of starting motor

The Engineering Digest

How Strong and Heavy a Motor Starter Must Be If Operated by Power Stored in a Metallic Spring

Analysis of the Power Requirements for the Starting Operation Shows That Much More Reserve Energy Is Needed, If the Starting-Crank Shall Be Discarded with Safety, Than the Average Inventor Provides in Devices Depending upon Mechanically Stored Force

DISCUSSING the technical requirements which must be made with reference to motor starters of all the different types which are in use or proposed—with the exception of those calling for physical exertion which are essentially only starting cranks in new form and new location—K. Schirmbeck calculates the strength and weight which necessarily must be incorporated in any apparatus purporting to start a motor by means of the power stored in a metallic spring. The reasoning presented is as follows:

According to the Hütte handbook for engineers, the work A stored in a spring of rectangular and uniform cross-section is expressed in the formula:

$$A=\frac{1}{6}\times\frac{b^2k}{E}\times V,$$

in which A is the work, in centimeter-kilograms, required to bring the spring to a certain tension *kb*, the latter expressed in kilograms per square centimeter, and V is the volume of the spring in cubic centimeters. E is the modulus of elasticity, which for hardened spring steel averages 2,100,000 per square centimeter.

As however the volume of the spring is less interesting in this case than the weight, it is better to substitute the weight G for V in the formula. Taking a specific gravity of 7.8 for spring steel, one has V equal to G divided by 7.8, so that the formula becomes:

$$A=\frac{1}{6}\times\frac{kb^2}{E}\times\frac{G}{7.8},$$

in which G must be expressed in grams.

How high the tension *kb* of the spring can be chosen depends upon the quality of the spring steel but also upon the precision with which the spring can be released from the motor which winds it up. Under the most favorable circumstances a maximum tension of 11,000 to 12,000 kilograms per square centimeter might perhaps be assumed, but for ordinary practical conditions the safe limit cannot be set higher than 10,000 kilograms. Inserting the values mentioned, we have:

$$A=\frac{1}{6}\times\frac{10{,}000^2}{2{,}100{,}000}\times\frac{G}{7.8}=1.015\ G$$

and in this A can be taken as expressed in the more usual unit of kilogram-meters if G is at the same time multiplied by 10 and is then taken in kilograms instead of grams. We then have:

A kilogram-meters = 10.15 G kilograms.

The spring can consequently do a work expressed in about 10 times as many kilogram-meters as its own weight in kilograms, and, as this calculation applies to any form of spring, whether leaf spring, coil spring or spiral spring, so long as the section is rectangular, the spiral spring may be taken as the most suitable, since it gives a rotary movement without additional mechanism and is of convenient shape.

Housing and mechanism must be assumed to weigh at least as much as the spring itself, and for the spring-starter in its entirety the working efficiency can therefore be taken only as one-half of that calculated for the spring. This work can be utilized in full only when the spring can be completely released in one movement. If the motor has been started and then suddenly stops without getting time to wind up the spring again, there will in most cases not be sufficient power for turning it on once more, if the starter is based on the calculated figures. In other words, the available work must be placed still lower; probably not higher than one-half of that calculated, at most two-thirds. This brings it to 2.5 times as many kilogram-meters, or at best 3.3 times as many, as the weight of the starting device in kilograms.

Diagram of Forces Involved in Starting

The relations which arise between the spring-starter and its work can be shown graphically, as by the diagram, Fig. 1, in which, however the wavy line BB, indicating the varying turning-moments required for turning the motor over, is only roughly estimated. The horizontal extension of the diagram, from left to right, corresponds to the number of turns of the crankshaft and the vertical extension to the torques of spring and motor. The torque line for the spring is a straight line AA intersecting the ordinate axis at a point corresponding to the tension of the completely wound-up spring and crossing the abscissa axis at a point corresponding to the number of turns of the crankshaft after which the tension of the spring is completely exhausted—this being the same as the number of turns required for winding it. In picturing the action in this manner it is assumed that the section of the spring is uniform and that friction losses in the apparatus decrease in proportion to the reduction of the spring tension.

As the curve BB represents the succession of varying torque efforts required for turning the motor over, it begins with a certain high torque needed to overcome the initial friction and the maximum inertia-resistance of the flywheel at the beginning of the movement. The acceleration is proportionate to the surplus torque of the spring and is in the diagram represented throughout by the portion of the ordinate lying between AA and BB. Where these lines cross, the acceleration becomes nil, so that it is only up to this point in the movement that the flywheel is accelerated by the unwinding of the spring. As thereafter the resistance to acceleration is no longer spread over the normal motor resistances overcome by the spring, the line BB now becomes a somewhat regular wave line depicting the variations of resistance, as these are determined by the compression work done during the last half of the compression stroke and the partial return of the force so spent during the first portion of the subsequent expansion stroke. Backward, toward the ordinate axis, the waves are flatter, because the variations of the required torque are toned down by the acceleration work in which they are merged.

It is also plain that the triangular area lying between the two axes and the line AA, and hatched vertically in the diagram, represents the amount of work which the spring can do, and that the horizontally hatched area between the axes and the curve BB, as far to the right as any given ordinate may indicate, represents the work absorbed by the motor for the number of turns of the crankshaft indicated by the ordinate in question.

[By means of one of the simple modern torsion dynamometers

it would evidently be possible to get the data for plotting correct curves BB for a number of different motors, with the termination of the curve in each case indicating the point where ignition takes place, and material of this kind, obtained under test conditions with the temperature of the motors and lubricants noted, would perhaps throw a convincing light on the whole starter problem, especially if curves of starter mechanisms —AA in the diagram—were plotted likewise.—ED.]

Interpretation of the Diagram

If the starter shall do its work properly, the first ignition must come at the latest at the turn at which the two areas are equal; in this case, then, at the point in BB marked with a cross. But ignition is scarcely to be expected at this point, unless a storage battery or another auxiliary ignition source is provided, as at this point the rotary speed of the machine reaches zero. For, from the point where the curves of power and resistance intersect, the spring is turning the motor over only with the assistance of the flywheel which here begins to give off the surplus of momentum imparted to it at the release of the spring, these elements in the action being represented by the vertically hatched area between the two curves to the left and the horizontally hatched area to the right.

Beyond this point [indicated by the cross] a movement of the crankshaft can in fact not be effected unless the spring tension still lies higher than the resistance-torque against turning the motor indicated in the diagram by the location of the beginning of curve BB. The motor should therefore be started before the spring tension drops to this value, as otherwise the starter will not be able to turn the engine over. [There seems to be a slight confusion in the author's diction at this point, arising from speaking of the point in the operation marked by the cross at the same time with reference to the number of revolutions it indicates and to its relations to the other supposed conditions indicated in the diagram. What he means to say is apparently that —with a starter mechanism really capable of handling its work— the point at which a sufficient number of turns has been made to cause the motor to start, even under unfavorable conditions, must come before the intersection of the two curves AA and BB, if a diagram of the action is plotted.—ED.]

From this reasoning it should be plain that the previous estimate of the work to be expected from a given weight of starter

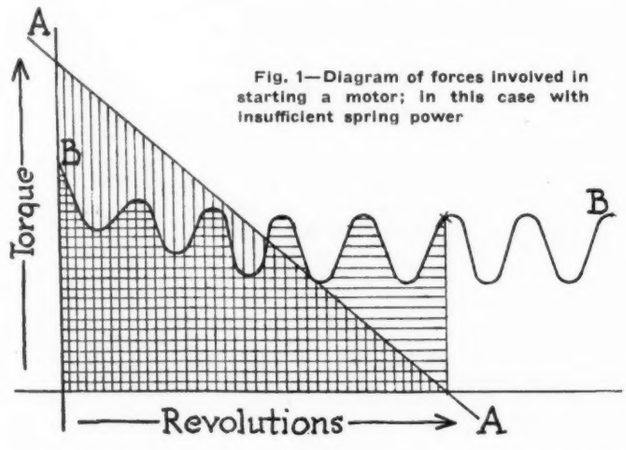


Fig. 1—Diagram of forces involved in starting a motor; in this case with insufficient spring power

mechanism is justified. Nevertheless let it be assumed that the work output in kilogram-meters equals 5 times the starter-weight in kilograms, which means that the starter accomplishes its purpose by one complete release, in order to gain a numerical insight in the working capacity of this type of device.

It may be assumed that a motor, which is already limbered up and of, for example, 80 by 130 millimeter bore and stroke, requires an average turning moment of 2.75 kilogram-meters for starting, which corresponds to a work output for each turn of 2π multiplied by 2.75 kilogram-meters; or 17.3 kilogram-meters. In order to keep the motorshaft rotating for at least 6 revolutions, there is in that case required, in accordance with the calculations, a spring weighing $(6 \times 17.3) \div 10 = 10.4$ kilograms, to which there corresponds a weight of the complete starter apparatus of about 20 kilograms. This result also agrees with the data of practical experience, the weight mentioned being the same as that of the old Lemâle starter. But what are 6 revolutions, if carbureter and ignition do not happen to be in first-class order?

The electric starter, on the other hand, gives a work output 4 times larger, in kilogram-meters, than the total weight of the starter plant in kilograms. [A ½ horsepower starter, producing 37½ kilogram-meters, is, for example, manufactured at a weight of about 30 pounds or 13⅔ kilograms, and may perhaps be made lighter.—ED.]

According to the foregoing, the spring starter, with its narrowly limited store of energy, can be of only limited usefulness. It is mainly available for motors which always start easily, and which, for this reason, are least in need of a starting mechanism. If it is made more practical in connection with average motors by combining with it an arrangement for winding it up by means of a crank, no ordinary ratchet device is found sufficient for this purpose; a gear reduction is required to reach the tension by which the initial resistance of a stiff motor can be overcome. And by this addition the weight of the set is of course again increased. The Ever-Ready spring-starter, for example, runs out by six turns of the crankshaft and can be wound again by 26 turns of an auxiliary crank.—From *Automobil-Rundschau*, September 15 and October 15.

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AIR Vent for Rear Axle.—In a new Swiss car called the Yaxa the casing of the bevel gear and differential on the rear axle is provided with a small air vent pipe. The purpose is to obviate air pressure when the gears get hot under hard work, such pressure having a tendency to drive the lubricating oil contained in the casing out at the axle ends and onto the brakes.—From *The Motor*, October 28.

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Melted Connecting-Rod Bushings Now Threaten Overloaded Motors

AT the recent military trials of motor trucks in France the anti-friction metal bushings of the connecting-rod knuckles melted in several instances, with the result of putting the truck temporarily out of commission in each case. If bronze bushings had been used under similar conditions the pins of the crankshaft and the bushings, too, would have been badly scratched, and it would have been necessary to turn the crankpins down and to fit heavier bushings, whereafter the motor would never be as good as before and the chance for having the connecting rod grip again would be much increased on account of the reduced diameter of the pins. While the principal cause of gripping, in a bronze liner, is failure of the lubricating system, and the same can be said of the melting-out of the bearings which has taken the place of this trouble since the general adoption of anti-friction metal for the bushings, the accident is made much more liable to occur if a motor is allowed to labor heavily on a gear that is too high for the load and road conditions, as under such conditions the low circumferential speed of the bearing surfaces allows the oil to be squeezed out under the strain of the heavy pull. On the other hand, the heat generated by running the motor idle at top speed, as careless chauffeurs will do under one pretext or another, such as "to warm up the carbureter" or "to burn out the carbon deposits and clean the plugs," can have the same effect in motors of very high rotary speeds. Casehardened crankpins present the advantage in connection with bronze bushings that they cannot be scratched by the latter, but the white-metal bushings give a lower coefficient of friction and are therefore usually preferred. A good but expensive method for avoid-

ing serious trouble if melting takes place is to have a double bushing composed of an outer bronze ring with a white-metal lining. Then if the lining melts, the vehicle can still—after the oil supply has been replenished and regulated if necessary—be driven slowly home by virtue of the remaining bronze ring, though with loud knocking of the joint.—After Henri Féron in *Omnia*, September 28.

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Prices Paid by Brazil for Cars Imported from U. S. and Other Countries

FROM January 1 to April 1 this year 1466 automobiles were imported and sold in Brazil, according to a German report. The total amount paid was 6,355,039 milreis. The value of this sum is given as equal to 8,643,000 German mark, which would make the average price of the automobiles about $1,450, but the silver value of a Brazilian milreis is $.546 and its course has been steadying of late under the influence of a gold reserve; the true value in dollars of the imports is therefore probably higher than quoted. The distribution of the importations among the various countries and the difference in the prices are, however, the most interesting features in the report and these are given in the appended table:—From *Allgemeine Automobil-Zeitung*.

Automobiles Imported in Brazil from January 1 to April 1, 1913

Country of Origin	No. of Cars	Milreis Paid	Average per Car in Milreis
France	474	2,204,283	4,650
United States	361	1,065,883	2,953
Germany	276	1,439,648	5,216
Italy	221	957,271	4,331
Great Britain	51	258,974	5,078
Switzerland	34	174,507	5,132
Belgium	25	126,851	5,074
Uruguay	15	52,782	3,519
Austria	5	41,591	8,318
Argentine	3	8,665	2,888
Spain	1	4,584	4,584
	1,466	6,335,039	

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CAR with Only 14 Bolts.—Leon Laisne of Douai in northern France manufactures a car with a 16-horsepower motor and weighing about 1120 pounds with a two-seater metallic body secured to the chassis U-frame by only 4 bolts. Steel stampings are used very extensively and not more than 14 bolts are employed in the whole construction. Triple coil springs contained within four vertical tubes take the place of leaf springs, the springs in each set of three coming into action successively if a shock is severe enough to reach them all. The suspension is believed to have been influenced by that used for the landing-chassis of the Bréguet aeroplane made in the same town.—From *The Motor*, October 28.

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Expediency of Employing Native Engineers for Sales Department in China

IT has been known for a number of years that the rich Chinese in Singapore, Bangkok, Batavia and elsewhere in India take very kindly to the automobile and prefer large sumptuous vehicles; also that the market among them would be larger if the driving of a car at a steady speed of 2 to 4 miles per hour were more convenient, mechanically, than it actually is. They like to promenade very slowly in their cars and to be seen doing it. The tastes of the Chinese in his home country are similar. A substantial dignity with some pomp and display but incompatible with habitual hurry is what he likes to confer upon himself, and it is now assumed all over the world that the new political development and the industrial awakening of the oldest and most populous commonwealth in the world will result almost immediately in a widespread adoption, by the merchant as well as the mandarin class, of occidental conveniences and tokens of wealth, among which the automobile comes perhaps first, since it is one which, by its very newness, does not clash with traditions in the Orient. But only very few Chinese roads or streets admit of driving at the speed considered indispensable in America and Europe; they are both rough and narrow, as a rule; in many cases muddy. It would not be astonishing—if also the fondness for slow promenading is considered—if cars provided with an electric starting equipment and also arranged to be driven very slowly by the same equipment, when this would be desired, were found to meet the wishes of this market. Chauffeurs are naturally scarce among the natives, and the dignitary himself would not easily consent to stepping out in the road, gathering his ample garments between his knees and cranking the motor.

Mr. Berrens, leader of the German engineering school for Chinese at Shanghai, gives some advice in *Technik und Wirtschaft* for September with regard to the best means for reaching this market for engineering enterprises. While the article on the whole is meant for the benefit of his countrymen only and does not relate specifically to automobiles, a passage or two may interest American exporters of cars, motors and supplies. He writes:

"It is especially for our large industrial works that the chance to employ Chinese engineers who can speak and write German [English] must be a pleasing one; for the knowledge of the country, the customs and the native temperament, in which the European never gains full insight, the heartier relations to workmen, the more familiar tone with prospective clients and their functionaries are qualities through which the Chinese engineer ..... can be of excellent service. Frequently the need is experienced of subjecting to competent and technical inquiry some report from the interior of the country which relates to an alleged business opening but may be based solely on the unconfirmed say-so of a *comprador*—and no one fabricates more serenely than a Chinese. To send a European engineer to investigate would not only be very expensive and time-consuming but would at once call the attention of all competitors to the opportunity, while his arrival at his destination would rouse the suspicions of the local authorities. The Chinese, on the other hand, travels inconspicuously and relatively cheaply; information flows to him easily from all sorts of sources.

"The solicitation of minor technical business, such as the sale of motors, machinery, electric and other technical equipment to responsible purchasers, both in the local district of an exporter's branch establishment in China and in wider circles, should likewise come much more natural to the young Chinese engineer than to a European or even to the merely commercial *comprador* and his representatives."

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ANNUAL of Automobilism in Italy for 1913-1914.—The special annual publication—Annuario dell'Automobilismo, del Motociclismo e del Ciclismo—which for the last ten years has been prepared by the Touring Club of Italy, 14 Via Monte Napoleone, Milano, has just appeared for the current year. It contains all the necessary information for motor tourists and cyclists, including the data of sport, technical information and complete lists of industrial and commercial firms; also a list of Italian owners. Two maps have been added to the volume, one giving the roads in Switzerland and Tyrol which are closed to motorists or subject to toll and the other the public automobile transportation lines in Italy. The two maps are in separate inserted folders for the convenience of travellers, and the lists of dealers in automobiles and accessories in the various towns, being as suitable for trade purposes as for tourists, make the book valuable at a distance as well as on the spot.

New Features in Design

(*Continued from Page* 955.)

ders, 60 by 100, cast in block, and both the inlet and exhaust pipes are cast integral with the cylinders. Silent chains drive both the magneto and the camshaft. The inlet and exhaust valves have a diameter equal to half that of the cylinder bore, viz.: 30 millimeters, and the lift of the valves is 8 millimeters. The crankshaft has two extra long bearings, and the diameter at the journals is 36 millimeters. A gear type of pump is employed for drawing oil from a sump in the crank chamber and delivering it through a non-return valve to the crankshaft bearings; the overflow, falling into troughs, is splashed up by dippers on the connecting-rods.

In the rear axle a worm of the straight pattern is placed over its worm wheel and is supported by two ball bearings of the combined thrust and journal type or "double purpose" type. The diameter of the worm shaft is 1 inch. A bevel type of differential gear is employed, the bevels being three in number.

Four 1914 Star Models

The Star Engineering Co. has a 1914 program consisting of four models. 10-12 horsepower; 12-15 horsepower; 15.9 horsepower, and 20.1 horsepower.

A part sectional view of the 20 horsepower engine appears in Fig. 14. The cylinders are 90 millimeters bore by 150 millimeters stroke and are cast in pairs. It is noticeable that the center webs of the connecting-rods are drilled to effect light weight and this is somewhat unusual in the case of the motor car engine, though common practice in aero-engine design. The cylinders are offset to a considerable extent as is clear by the fact that the lower ends of the cylinder barrels have special provision for connecting-rod clearance. On account of the offsetting it has been possible to employ very short pistons and the piston length is consequently only about equal to the cylinder diameter; the pistons have three rings and the skirts are extremely thin, the tops are conical and unribbed.

The 10 horsepower engine and gearbox are combined into a unit construction. In this case the cylinders are cast in block and there are only two crankshaft bearings. Thermo-syphon cooling is adopted and it is pleasing to note that the walls of adjacent cylinders are not united—Siamese twin fashion—but have water space between them. Two piston rings only are used and the pistons have flat tops. The connecting-rods are drilled for the sake of lightness.

A leather clutch is used with a ball-thrust disengaging collar. It is noticeable that a plain journal bearing is used at the forward end of the gearbox against the clutch as well as for the spigot bearing, while there is a ball bearing at the rear end of the box. Presumably the use of this bearing is to take side thrust due to an uneven brake pressure that may exist.

The 10 horsepower gearbox provides three speeds and a reverse, the higher speed being a direct drive by dog clutches. The drive shaft is square and the spigot bearing is a plain one with phosphorus bronze brush. The wheels on the layshaft are fixed by feathers. The constant mesh pinions have a tooth width of seven-eighths of an inch and the remaining wheels are five-eighths of an inch wide. The teeth are well rounded to facilitate engagement. The drum of the transmission brake is 6 inches in diameter and 3½ inches wide and it is mounted upon a square upon the driven shaft.

Sunbeam Retains Three Models

The Sunbeam Company have retained the three models manufactured during 1913 and detail alterations are not very extensive; indeed it is necessary to look closely before one discovers alterations at all.

The dimensions of the engines are as follows: 12-16 horsepower 80 by 150 millimeters, 16-20 horsepower 90 by 160 millimeters; the 25-30, 90 by 160 (six-cylinder). In each of the three chassis the gearboxes have been moved back a matter of three inches to permit extra shaft length between the clutch and gearbox.

The result of setting the gearbox further back in the frame is naturally to shorten the propeller-shaft. At the same time the dimensions of the latter have been further altered so that the shaft can be removed without disturbing the axle or the gearbox. A regular provision in connection with this part of the mechanism is that of a belt pulley surrounding the universal joint at the front of the propeller-shaft which serves to drive the lighting dynamo. This is a standard fitting whether a dynamo is to be used or not.

On last year's four-cylinder models the fan was driven by skew gearing, whereas on the present design a belt is used with the result of rather more quiet running.

Straker-Squire Cars at Olympia

The builders of the Straker-Squire car have adhered to their policy of concentration on one model only and it is interesting to note that the present year is the seventh during which this policy has been practiced. A speed model chassis has been introduced

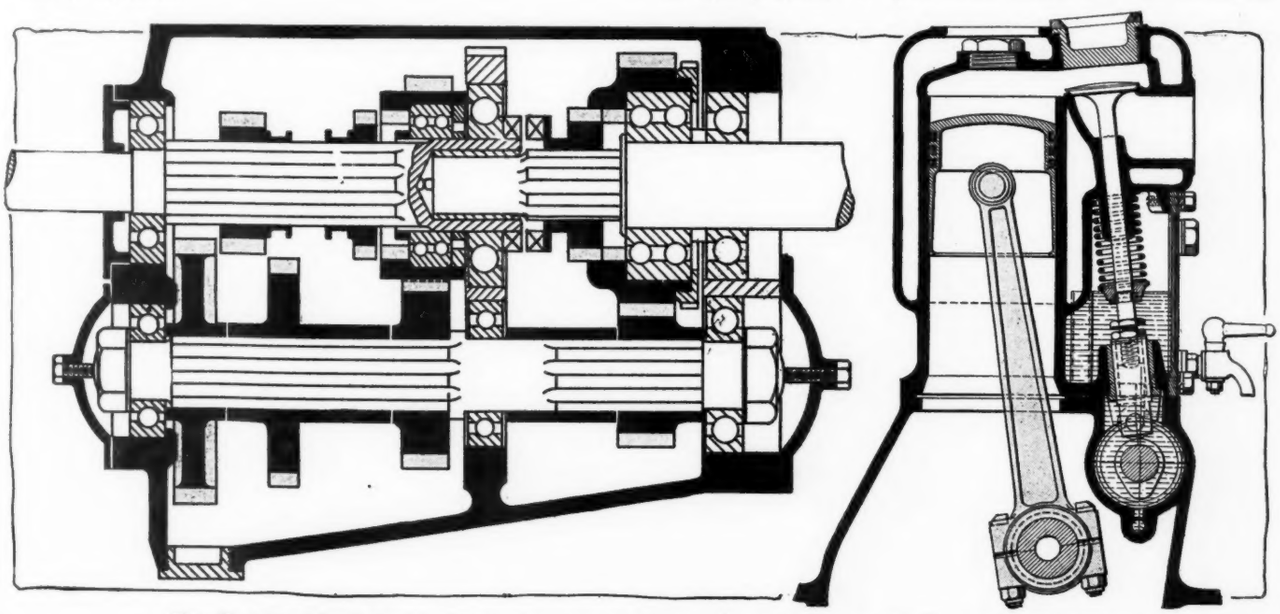


Fig. 15—Left, Argyll change speed gear for 1914. Right, valve silencing arrangement by Brazil Straker

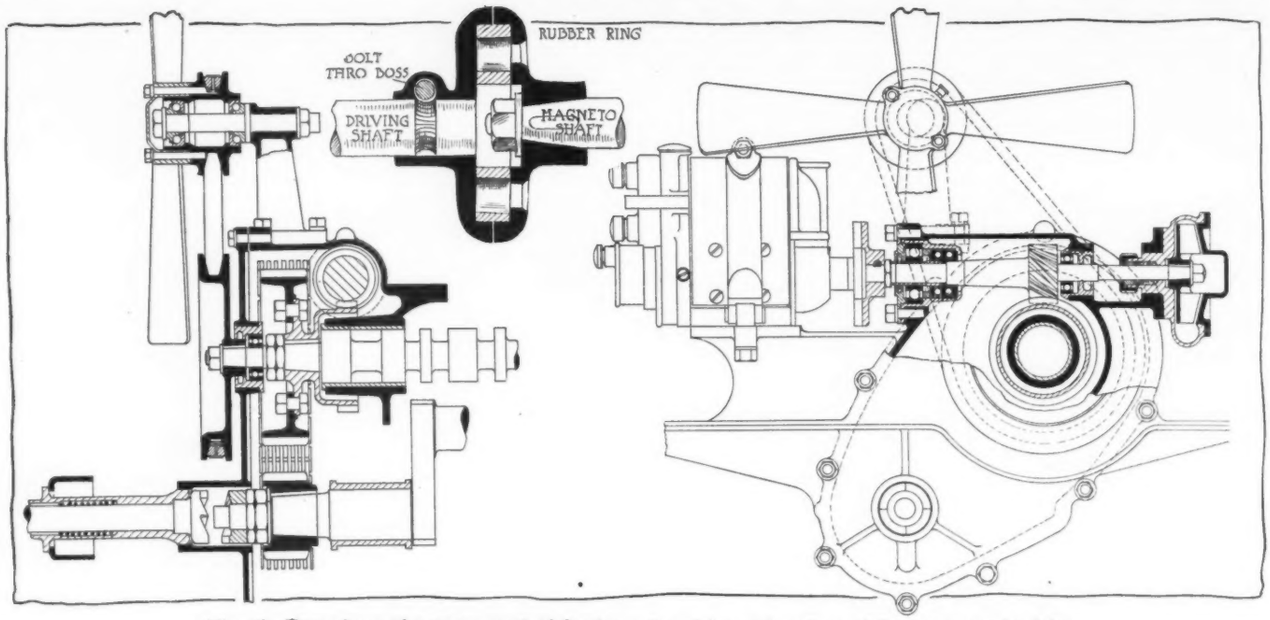


Fig. 16—Two views of arrangement of Sunbeam fan drive and a view of Austin magneto drive

which is the same in every particular as the standard with the exception of the engine, which is especially tuned up and has various special materials embodied in its construction so as to render it more suitable for high speed work.

The new features of the standard 15-20 horsepower chassis are a 90 millimeter bore engine giving increased power for larger bodies as well as greater efficiency and liveliness to the chassis generally, a rather larger wheel bore and a few small refinements of detail such as the following: New oil indicator in crankcase; improved form of crankshaft; improved silencer; Truffault shock-absorbers; improved water pipe clips; and new actuating gear to change-speed mechanism.

The cylinders are cast in block, inlet and exhaust valves being all on one side. The valves are interchangeable, and constructed of nickel steel. Both valves and tappets are inclosed by aluminum plates. The crankshaft of special 40-ton steel has five main bearings. The connecting-rods are special steel drop forgings of I-section. Both main and big-end bearings are die-cast white-metal. The camshaft and magneto are driven by skew gearing, and the crankshaft timing wheel is provided with a spring drive to eliminate chatter. The cams are machined and ground from the solid, and are one with the shaft. The camshaft is provided with four bearings, and the skew gear for driving the oil pump is cut integral with it.

Special Attention to Cooling

The fan is a four-bladed one and has a diameter over the blades of 15 inches, the hub is mounted upon ball bearings and the pin upon which the fan is supported is eccentric for purposes of belt adjustment. The fan is speeded up from the camshaft about two to one, so that the fan runs about four times crankshaft speed. The front sectional view shows the Bosch magneto driven by a transverse shaft which receives its motion from a skew gear wheel upon the camshaft. This wheel is bell-shaped in section to make room for one of the camshaft bearings and a flange upon the wheel boss has secured to it the chain wheel for driving the camshaft. The camshaft bearings are of large diameter—a fairly common practice at the present time—so that the whole camshaft may be pulled out entire. In the front view the centrifugal pump for water circulation can be seen in section. An interesting alteration from the point of view of the driver is that the steering wheel has been enlarged from 15.5 inches to 17 inches in the smaller cars.

An alteration in the lubricating system consists of a false bottom of gauze placed in the under part of the crank chamber.

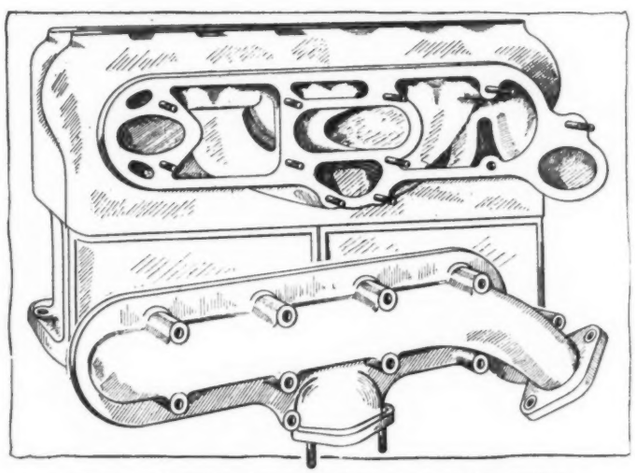


Fig. 17—New Humber cylinder and manifold casting

The false bottom serves as a filter and also as a splash preventer at such times as when the car is running fast over uneven ground.

Since a certain amount of trouble has been experienced in the past with burst silencers a new type of stronger construction has been designed. In all the types the diameter of the rear wheel brake drums has been increased.

Argyll Change-Speed Gear

The Argyll change-speed gear, Fig. 15, has three shafts fitted within a casing, two in alignment and one parallel. One of the aligning shafts is the main shaft connected with the engine at one of its ends, the other of the two aligning shafts is the driven shaft, while the third shaft is the layshaft supported at each end and at the center.

At the end of the first shaft near to the engine are two spur wheels, one slidable and one loose, between which spur wheels is slidably mounted a dog clutch, and on the driven shaft is mounted one loose spur wheel, a double-ended dog-clutch being interposed between the loose spur wheel and the end of the driving shaft. The double-ended clutch is movable simultaneously with the first-mentioned clutch. On the layshaft are mounted four fixed spur wheels.

An idle wheel engages the second of the four spur wheels and is adapted to be engaged at certain times by the slidable spur

wheel on the driving shaft thus giving a true direct drive.

In the operation of the change-speed gear the first speed is obtained by sliding the spur wheel on the first shaft to cause its teeth to engage with the teeth on the first spur wheel on the layshaft, the motion of which is transmitted through the spur wheel at the remote end of the layshaft to the spur wheel on the driven shaft, the last-mentioned wheel being temporarily engaged to the driven shaft by one end of the double-ended dog-clutch.

Reversal is effected by sliding the spur wheel on the main shaft so as to disengage its teeth from the teeth of the first wheel on the layshaft and to cause it to engage the idle wheel which is in mesh with the second spur wheel on the layshaft, so that the layshaft is driven in the opposite direction from the main shaft, rotation of the layshaft being transmitted to the driven shaft as the double-ended dog-clutch remains engaged with a spur wheel on the driven shaft.

The second speed is obtained by sliding the first clutch into engagement with the loose spur wheel on the first shaft which in turn drives the third spur wheel on the layshaft, the double-ended clutch being slid further in engagement with the spur wheel on the driven shaft.

Humber Cylinder Jacket Design

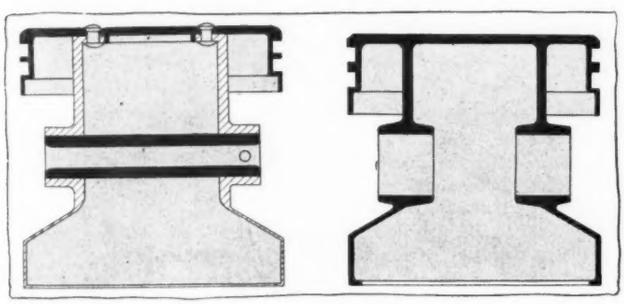
A new cylinder and jacket design by Humber, Ltd., has a long cover plate Fig. 17, arranged the whole length of one side of the cylinders, and this forms the exhaust branch and part of the inlet piping. The cylinder casting is made with apertures which are inclosed by the cover plate, and also port openings communicating with the exhaust valve pockets, these openings being also in communication with the interior of the pipe portion carried by the cover plate. In addition there is an aperture which communicates with the inlet branch, forming part of the cylinder casting, the outlet leading into a short pipe bend cast integral with the cover plate to which the induction pipe is attached.

In this way separate cover plates such as are usual for covering the opening left to facilitate molding are dispensed with, a single element attached to the cylinders serving as the exhaust branch, water jacket cover plate, and inlet pipe attachment.

The manner in which silent running of the valve mechanism is secured by Brazil Straker & Co. is distinctly new. The camshaft, Fig. 15, is arranged to run in a pocket cast in the crank-chamber. This pocket is in communiciation with an upper chamber which incloses the valve spindles, tappets, etc., and which is cast as part of the cylinder casting. The upper chamber is closed by a door. Oil is pumped into both chambers through the duct shown and after flowing into the upper chamber to the level of the overflow pipe returns to the crank chamber. The whole of the bearing parts of the valve mechanism operate while submerged in oil. A cock is provided to drain the upper chamber when desired.

New Calthorpe Cars Shown

The Calthorpe Motor Co. have put upon the market for 1914 three models, viz.: 12-15 horsepower, 15 horsepower and 20 horsepower. The pinion is fitted to a taper and there are two feathers to take the drive. The width of the teeth is 32 millimeters. The crown wheel is attached between the two parts of the differential box, so that to change a crown wheel for gear ratio alteration or in case of breakage it is necessary to take adrift the differential box; the objection is not a serious one however. The teeth of the bevel and crown wheel are No. 5 pitch. The axles have a diameter of 29 millimeters and large ball journal bearings support the axles on their inner ends. To prevent leakage of lubricant from the casing and to form abutments for the ball thrust bearings shown, light gun metal castings are pushed into the axle casing and these are held in position by the flanges of the axle tubes (see drawing). The Rudge Whitworth type of detachable wheel is employed. The entire axle is stiffened by a .5-inch tie rod passing beneath the casing, the ends being fixed to bosses forming part of the brake carrying brackets; these brackets, as can be seen, are particularly stiff ones and are well adapted to take the pull of such a tie road as is fitted. Sometimes these tie rods are secured to cast bosses that are not of sufficient strength for the great strains they may be called upon to bear. A noticeable feature among much that may be considered to be pretty well standard design is the satisfactory provision made for protecting the brake shoes from oil and at the same time sup-



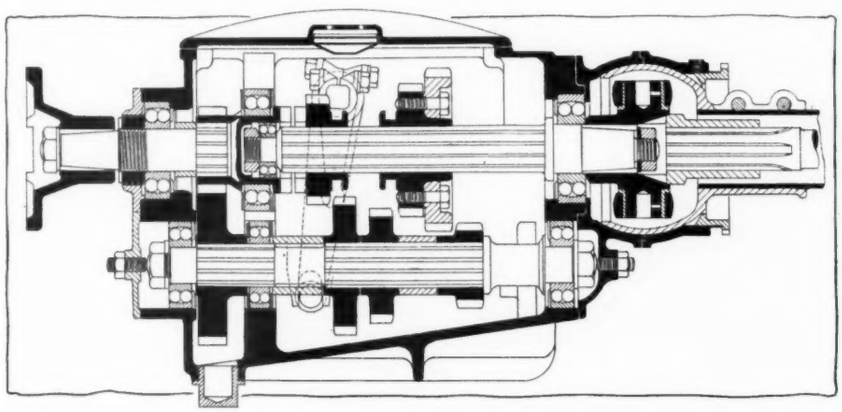


Fig. 18—Zephyr light-weight piston castings

Fig. 19—View of interior of gearset with Skefco bearings

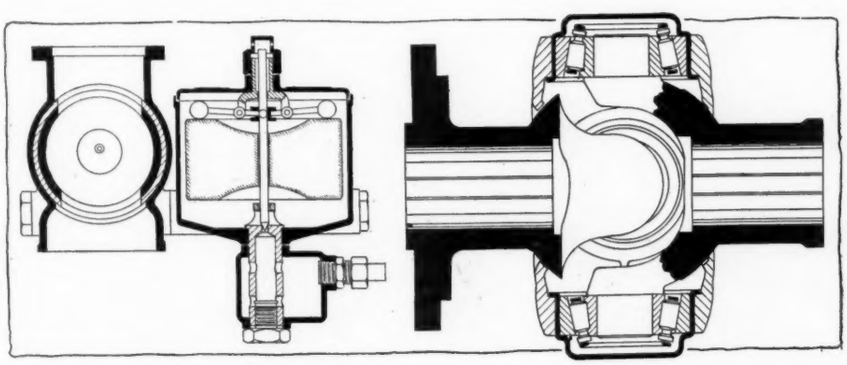


Fig. 20—Left, White & Poppe carbureter float arrangement. Right, sectional view of Timken universal joint

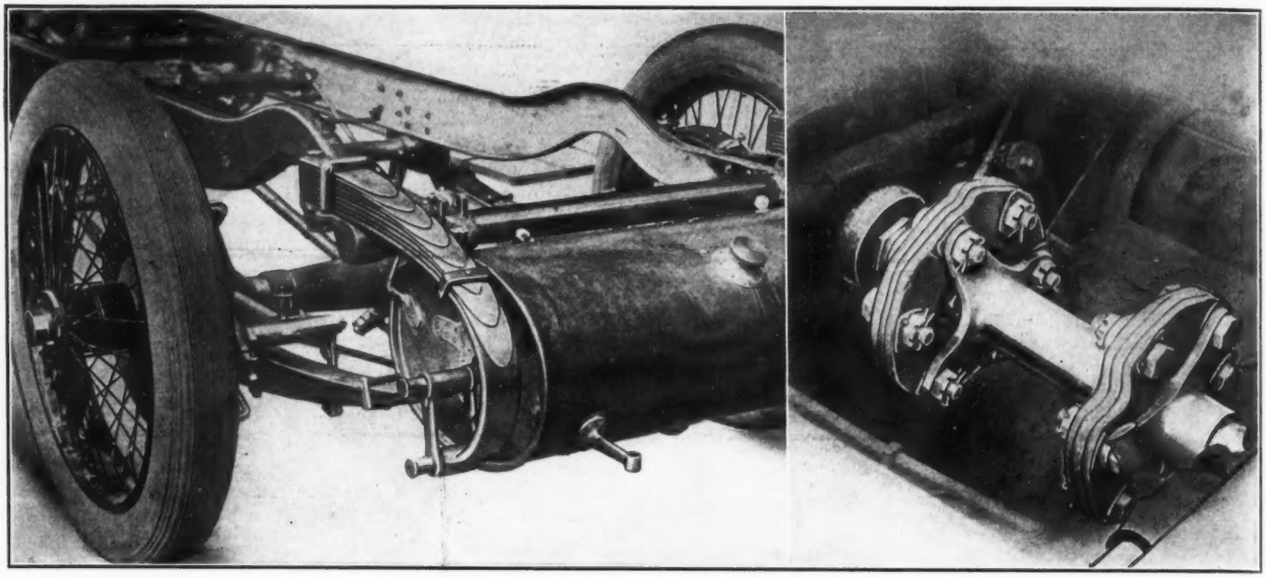


Fig. 21—Left, rear view of the six-cylinder Daimler chassis. Right, Universal coupling used on Daimler six comprised of leather disks

plying oil to the shaft of the brake operating cam. It will be seen that there is a large annular groove to catch any oil that may escape from the hub bearing and that a drilled hole leads from the bottom of this groove to the bearing mentioned.

A plan view of the gear box is shown in Fig. 13. There are four speeds and a reverse and the gate change system is of course employed. Noticeable features are that a plain gun metal bush is used for the spigot bearing, that a jaw or dog clutch is thrown into engagement for the direct drive and that a spring and ball arrangement is provided to lock the gear change rods in position.

Skefco Ball Bearings Interesting

These bearings are coming much to the fore and a number of them are to be found on various parts of the modern chassis. The feature of the S. K. F. bearing is its self-aligning property, the outer race having a spherical section. Thus the self-aligning movement is performed by the balls themselves and not by sliding friction. This movement is rendered easy by the larger number of balls over which the load is distributed and as the load is automatically and equally divided between both rows of balls, the most favorable working conditions are obtained. Some consider that there is a tendency for the two rows of balls to be forced together causing a certain axial pressure on the cage and thus causing wear, but this is not the case as the races are designed in such a manner that the tangents of the balls at their points of contact with the races are parallel and always tend to keep parallel. This effort of the balls prevents the races from approaching each other. To discuss the question a little further. The load on the outer race will be on the line which passes through both contact points on the races and through the center of the ball, being continued in a straight line to the center of the spherical race of the outer ring, viz., the center of the bearing. The existing powers will be found to balance each other, that is to say, the pressure of the balls at their contact points with the spherical surface of the outer race will be balanced by an equal pressure between the balls and the races of the inner ring. A Skefco gearbox is shown in Fig. 19.

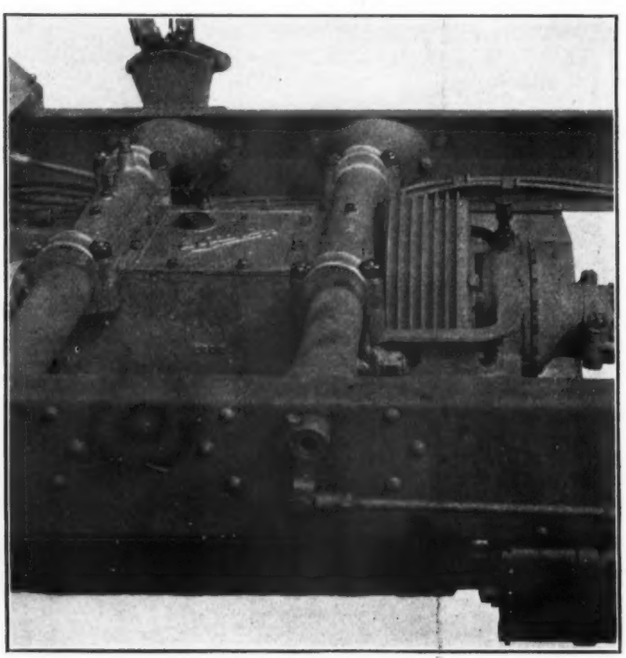


Fig. 22—Crossley 20-horsepower gearbox

Timken Roller Universal Joint

These bearings are becoming more popular each year on this side of the water and one reason, doubtless, for this is the ease with which they may be adjusted. For this purpose, as most will be aware, it is only necessary to slide the outer cup and inner cone towards one another, thus decreasing the vertical distance between them and so taking up any clearance between the roller and the surfaces upon which it works. The angle of taper of the rollers is about 5 degrees or about 1 in 12, and the standard type of bearing has a cup width of from 17 to 22 millimeters which means that a maximum of 1 millimeter of wear can be taken up by adjustment only. Fig. 20 shows an application to a universal joint in which all the bearings are of the Timken type.

Daimler Carbureter Has Seven Jets

The rapid advancement which has been made in the subject of carburetion has been one of the chief features of automobile progress during recent years. The Daimler company have devoted much time and energy to the evolution of a new carbureter, and, as the result of lengthy experiments, have designed the highly efficient type described in detail below.

The chief feature claimed for the new Daimler carbureter is the remarkable responsiveness and good acceleration of engines to which it is fitted.

The new Daimler carbureter has seven jets. One of these

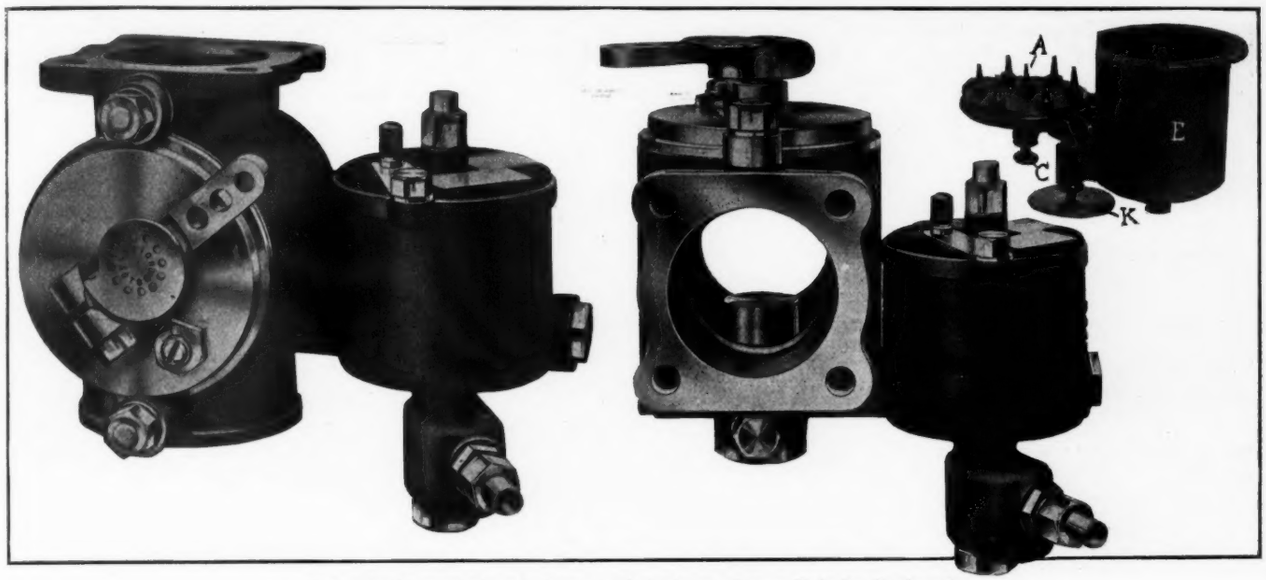


Fig. 23—Assembled and disassembled views of new Daimler Carbureter

placed centrally, is employed for slow running, and the remaining six come into operation automatically as the suction of the engine increases.

It will be noted that the central jet, marked "A," Fig. 23, is provided with a needle valve "B" and adjusting screw "C." This arrangement enables accurate setting to be made for slow running of the engine.

The other six jets are placed in a circle, and are supplied with petrol from the common chamber "D," which is in communication with the float chamber "E." Above each jet is a circular orifice, marked "F," in the carbureter body, which acts as a choke-tube, and between each of these jet orifices is a similar hole allowing the entrance of the extra air supply. There are thus twelve holes, each being provided with a steel ball, which is held down in place by the light spider-shaped weight, marked "H" in Fig. 24. Above the spider weight is placed a distance piece.

The White & Poppe carbureter is well known, and its peculiarity lies in the construction of its variable jet. The hole in the jet column is eccentric and there is an eccentrically drilled hole in the top of the movable sleeve that surrounds it. Partial rotation of the sleeve varies the effective area of the opening and thus varies the delivery. The 1914 models have been considerably lightened in these details and the float chamber has been rendered detachable in such a fashion that it may be fixed up in one or other of several positions; a glance at Fig. 20, the plan view, will explain how this is done. This must be considered a useful improvement as it facilitates the fitting of the carbureter to cars of various types. The carbureters are made in three types, namely, 20/25, 30/35 and 40/45.

Two new motors have been introduced. The first has four cylinders, 60 by 90 millimeters, and forms part of a complete power unit, with multiple-disk clutch, three-speed gearbox and reverse, gate change control and other well-combined details. The inlet and exhaust valves are on opposite sides of the cylinders and presumably this arrangement of valves has been adopted to permit large valves to be used.

The other engine is a four-cylinder one of 110 by 150 millimeters stroke. In this engine the cylinders are cast in pairs.

The 12-horsepower engine is similar to the 10-horsepower engine, but of stronger construction. The cylinder dimensions are 69.5 by 120 and the valves have a diameter of 32 millimeters and a lift of 8 millimeters.

With the considerable increase in engine speed that is now prevalent it is important to reduce to a minimum the weight of the reciprocating parts.

In the Zephyr piston construction, assuming as before that the bosses do not support the pin, but are solely for the purpose of providing bearing surface and means of fixing, it will be seen that the load is practically uniformly distributed over the center portion of the pin, the reactions taking place some way from the ends; the stress on the piston pin is largely one of pure sheer instead.

The construction of the piston lends itself to efficient gudgeon pin attachment, as the boss supporting the pin is outside the skirt and accessible. An ordinary split end taper pin is used; such practice would not be possible with a piston of the usual construction.

The piston head is usually riveted to the trunk portion, but in some cases welding is used; the makers, however, prefer the riveted piston, and they have been at some pains to prove its superiority.

It is interesting to note that the standard weight of the piston used on the Ford car is 3.5 pounds, that the malleable Zephyr piston weighs 2.25 pounds, and that the steel Zephyr piston weighs only 11 pounds 7 ounces complete, with rings and gudgeon pin.

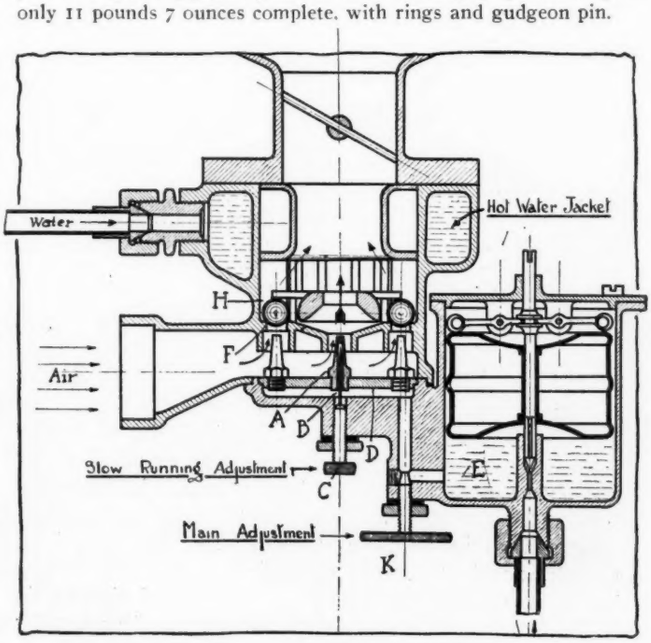


Fig. 24—Sectional view of White & Poppe carbureter

The Automobile

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The Russian Model

FRANCE, Germany and England have seen fit to bring out, what they call special Russian models, which differ from those used in other continental countries by having greater clearance and greater treads to meet conditions local to the poorer highways of the Czar's empire.

In Continental Europe clearance is not a factor, the buyer wants little for the French, German or Swiss roads, in fact, he prefers low bodies, those with little side sway. France would be foolish, so would Germany and so would Italy, to try and sell these low-clearance vehicles in Russia. It would be impossible, casting money into sewer. But Europe, schooled in the arts of export business with the many lands of the world, has seen early the need for a special Russian model, and has also seen the broad possibilities of Russia and Siberia as selling markets.

Russia Offers Big Field

The extent of selling the proper cars in Russia was recently well evidenced by a French dealer visiting in America, who preferred the agency of any reputable car for Russia rather than the best agencies in France or England. The Russian field is a big one; distances are so great, as in Western America, that cars are indispensable; and as our western cities of 10,000 population have many more automobiles than cities of similar size in the East, so we may look for big sales in Russia. But a Russian model is needed, with two cardinal characteristics—high clearance and wide tread.

The Malicious Gossip

THERE are today traveling representatives of not a few concerns connected with the automobile industry who are apparently more interested in passing along the gossip story about some maker in financial difficulties than in giving a straightforward story of facts as they believe them to be. Some of these gossip-spreaders and would-be selling representatives are short-sighted enough to imagine that their tales of difficulties of the other maker are going to make their own selling arguments stronger, whereas, the opposite will more often prove true; the judicious buyer, that buyer who has the lasting good of the industry at stake, will reduce his estimate of the salesman in direct proportion as his tea-cup gossip increases.

Gossip Is Injurious

This hotel-corridor gossip is today working an injury, and is having a damaging effect on certain companies about which the rumors are often circulated, and which companies in the majority of cases, will be doing business in the same old stand long after these gossip salesmen have been forced to sever their connections with the automobile industry.

Gossip about any industry is most damaging. Take a comparison: Let any group of depositors begin gossip concerning the financial standing of any reputable banking institution and how long will it be before a run will be started on that institution, which can only be stemmed by its ready cash on hand and its ability to get all necessary capital from related institutions. Malicious gossip could wreck financial institutions which require a strong dependence on public good-will.

These are days of financial stringencies; from ocean to ocean, these stringencies are being felt as much in one industry as another. They are not local to the automobile industry, and when a country is in the zone of such a condition is the time when rumors must be stilled, and when each maker owes to the industry that effort.

The tea-cup gossip has taken such hold of not a few traveling representatives that they are proving a daily menace. They are fanning the discontent of others, who seem hungry for such tales. They are malicious in that often these rumors are absolutely unfounded, and are connected with the names of the stalwarts of the industry. Some of the oldest names in the industry are coupled with these gossip stories; and while their association with these names should stamp the gossip on the face as foundless tales, there does seem to be enough fertile soil on which they fall to insure their propogation in exaggerated form.

The entire industry should take this malicious gossip in hand. There are two ways to do it: First actively by discounting all of these glib-tongue remarks from tea-gossip company representatives; and second, by letters of instructions to all of their own travelling representatives advising them to entirely eliminate such form of conversation from their business and idle-hour talks. Our Automobile Chamber of Commerce can lend its hand and our accessory organization can do its part. A united movement will soon let these tea-cup gossipers see themselves as others see them.

Electrical Engineers Discuss Generators

Arguments For and Against the Slipping Clutch Method of Controlling Generator Output Advanced by Experts—Opponents Contend That Generator with Field Regulation Operates More Efficiently—Relative Advantages of One-Wire and Two-Wire Systems Considered

NEW YORK CITY, Nov. 15—Three papers dealing with the electric lighting, starting and ignition of automobiles were read at a meeting of the American Institute of Electrical Engineers last night. These were Dynamo Electric Lighting for Motor Cars by Alfred Waller, Advantages of Clutch Type Generator and Separate Starting and Lighting Units for Motor Cars by Alexander Churchward, and Electrical Equipment of Gasoline Automobiles, by Frank Conrad.

Abstracts of the three papers follow:

Waller on Automobile Lighting

The design of motor car lighting apparatus begins with the choice of a satisfactory lamp equipment. This fixes the quantity of energy which the lighting system must supply at any time, and indicates the dynamo capacity to be provided.

The dynamo must be geared to give its full output at the average speed reached when driving, with all lights on, in order that the battery reserve may be drawn upon only when the car is not in motion.

When a battery auxiliary is used it must be connected to the dynamo when conditions are right for charging, and disconnected when the engine is at rest, to prevent discharge through the dynamo. Safety and convenience require that this action should be automatic, also that the output of the dynamo should be limited to a predetermined and safe maximum, regardless of dynamo speed. This leads to a discussion of methods devised to secure automatic control, and to the speed rating of the dynamo.

This is limited on one hand by the weight, size and cost of slow-speed dynamos, and on the other, by consideration of wear on bearings, commutator and driving means of the high-speed type.

Churchward Advocates Clutch-Type Generator

A constant-speed dynamo for automobile lighting and for battery charging is to be preferred to other designs chiefly because it has the correct characteristics for its assigned work, because its efficiency is high while the wear is small, and because it is able to maintain a potential at the lamps so constant that it will even carry the lamps with the battery disconnected without injuring them.

The generator and starting motor should be built as separate electric units because of the lighter, smaller, less complicated battery required, because of the greater reliability of the separate units, and because the characteristics of the starting motor (necessarily series-wound) are directly opposite to those of the generator (which is of necessity either shunt or compound-wound).

Conrad Considers Electric Equipments

In considering the relative merits of various ignition devices the use is advocated of an induction coil operating from a constant-potential circuit in connection with a device which will limit the current at low speeds and still permit sufficient current flow at the higher speeds. A variable-contact device is used to operate the coil at its most efficient point and this eliminates to a considerable extent the necessity of manual control of the firing point. This ignition system produces a spark no matter how slowly the engine is turned over, thus lending itself particularly to electric motor starting.

A lighting generator should be capable of supplying current equivalent to the average lamp load, when the car is running at a speed of 15 miles per hour. The method of regulation advocated is a demagnetizing series coil in the battery circuit, thus maintaining constant charging current. The lighting circuit is so connected that the current to the lamps will not pass through the series coil, thus tending to maintain a constant charging current independent of the lamp load.

For starting purposes two schemes are possible, namely, the use of the lighting generator as a motor, or the use of a separate motor. The separate starting motor is advocated.

Discussion Very Animated

Much interesting discussion followed the reading of the papers. H. Ward Leonard was one of the principal speakers but his remarks were less in the nature of discussion than an exposition, based on his experience of the desirable features of the perfect electrical equipment for the automobile. He said that after considering all details of systems in general it would be found the crux of the whole problem was the means of regulating the generator automatically. The importance of this detail could not be exaggerated.

The discussion proper was directed largely to Mr. Churchward's paper on the slipping clutch generator. Leonard Kebler in giving his opinion on this form of generator regulator stated figures he had obtained from tests made with a slip-clutch drive in comparison with one in which current regulation was effected by electrical control of the field strength through the use of a vibrator type regulator. From the results he found that much more power was consumed on high speeds with the slipping-clutch than with the electrically controlled generator, this waste evidently being represented by the heat generated between the clutch surfaces and the additional power required to drive the highly spinning member if this is provided with cooling fins.

Almon W. Copley also spoke on the slipping clutch, holding that it was only on the low speeds that the generator controlled by bucking coil showed a less efficiency. On high speeds the bucking coil method had the advantage from the point of view of efficient operation.

The other participants in the discussion dealt chiefly with the relative merits of the one-wire and two-wire principle and the most suitable circuit voltage. A. D. T. Libby advocated the 12-volt system as being more suitable for efficient motor design.

Two Papers Read By Chairman

Two papers written by C. E. Wilson and B. F. Bailey were then read by the chairman and the meeting concluded with some short remarks in the way of answers by the authors of the three leading papers. Mr. Churchward said he was pleased to have brought about a discussion of the relative merits of the slipping clutch and field regulation methods of generator control. The fact that so many of the former type were in successful operation seemed to him to show that several advantages must be possessed by the mechanically controlled generator.

Mr. Waller, in giving his views on the one-wire system for automobiles, stated that the advantage of less wiring was insignificant compared to the double risk of short-circuits and the difficulty of making the frame connections from the lamp leads. He strongly advocated the double-wire principle.

Italian Manufacturers Form Union

TURIN, ITALY, Nov. 11.—A union of the automobile manufacturers of Italy has been consummated. It has been formed for the defense and progress of the Italian automobile industry. It will include the most important automobile manufacturers in Italy and will try to form a connection with the international automobile makers.

New Tariff Aids Importers' Automobile Salon

NEW YORK CITY, Nov. 17—Not only does the new tariff reduce the duty on foreign automobiles imported into this country, but it also provides that they may be brought in for exhibition purposes for a period of 6 months without the payment of any duty at all. Taking advantage of this the exhibitors at the Importers' Automobile Salon, to be held in this city January 2-10, are arranging to bring over more complete exhibits of foreign cars than have ever been seen in this country.

In past years the salon exhibitors brought over only such cars as they felt confident of being able to sell readily, because of the 45 per cent. duty which they had to pay on each car. Now, they are arranging to bring over for the coming salon the complete exhibits which their respective companies showed at the recent Paris salon and at the London Olympia show, which closed last week. The countries to be represented at the 1914 salon will be France, Germany, Belgium, England, Italy and America.

No Receiver Granted for International

Decision Makes Litigant a Preferred Creditor—Fresh Arguments Will Be Heard This Week on New Loans

NEW YORK CITY, Nov. 15—Judge Garretson, sitting in the Supreme Court of Kings County, has handed down a decision in favor of the plaintiff in the suit of G. E. Blakeslee, a shareholder, against the International Motor Co., et al. The action grew out of the controversy between the minority and majority stockholders over a proposal to pledge $1,200,000 of the corporation's assets as security for a loan of $1,000,000.

The decision states that the continuance of the temporary injunction and the application for a receiver are denied upon condition that the defendant, International Motor Co., shall give a $50,000 security bond to indemnify the plaintiff for whatever loss he may sustain pending the trial and judgment of the dissolution action, and shall satisfactorily stipulate that during that time it will not execute a mortgage upon its assets and will not increase its unsecured liabilities by a loan in excess of $500,000, without leave of the court.

The decision concludes: "Upon failure to comply with these conditions the motion for an injunction is granted and the question of an appointment of a receiver is reserved for a further hearing on a day to be fixed."

Whether the company can secure a loan under the above conditions is not yet known. The meeting of voting trustees, scheduled for Friday, however, has been postponed indefinitely.

Supreme Court Delays Fight

WASHINGTON, D. C., Nov. 18—The United States Supreme Court today refused to advance the case of J. T. Hendricks, plaintiff in error, vs. State of Maryland, in which Hendricks seeks to combat the power of the State of Maryland to tax motor cars from the District of Columbia doing an interstate business when they enter Maryland. Hendricks had hoped by having the case advanced that a decision might be rendered before the 1914 tax becomes due in Maryland, but has been disappointed in this. Plans are now under consideration to start other measures to give motorists in the District of Columbia the same reciprocal rights of Maryland as enjoyed in that state by motorists from other states.

Weed Prosecutes Infringements

NEW YORK CITY, Nov. 18—Recent decisions in favor of the Weed people will probably bring forth suits against some of the other chain users. The latest one is that of the Parsons Non-Skid Co., Ltd., and the Weed Chain Tire Grip Co. vs. S. Gray for the alleged infringement of the Weed patents. A designation order has been given to have the case tried before the Hon. Henry Lacombe, of the U. S. District Circuit Court of Appeals for the Second Circuit to hold the case in the U. S. District Court for the Southern District of New York.

Ten Years for Automobile Thieves

LOS ANGELES, CAL., Nov. 14—In the future, all motor car thieves convicted in the criminal court of Los Angeles will be sentenced to 10 years in the penitentiary. This was the official edict of Judge Willis today when he imposed the extreme penalty for grand larceny, a 10-year penitentiary sentence, upon G. S. Graham who was found guilty of stealing a motor car.

"The joy-riding thief is a menace to the public," declared Judge Willis in pronouncing sentence, "and deserves no sympathy. In sentencing this man for 10 years, I have established a precedent that I will follow."

Alleges Garford Infringes on Rolls-Royce

NEW YORK CITY, Nov. 18—A suit which promises to be of interest to the trade in general has been brought up in the U. S. District Court of the Southern District of New York. Frederick H. Royce, of the Roll-Royce, Ltd., Lancaster, England, claims that the Garford car has certain infringements of the Rolls-Royce car and he has brought a complaint against the R. & L. Co., New York, dealers in Garford cars. He claims infringement on certain new improvements in motor vehicles, consisting of an improved method of mounting such parts of the power mechanism as the motor, the change speed gearing in the frame, adopted to carrying the same, involving a U. S. patent No. 888,535, granted on May 26, 1908. He says in his patent:

"The usual method hitherto employed has been to fix such parts rigidly to the side members of the frame. With this construction the said parts operate as stays, and consequently when the vehicle travels over such uneven ground as will cause the side members to move relatively to each other, a considerable strain is thrown on the said parts. To overcome this defect I suspend the parts from the side members of the frame."

What he claims: "Means for suspending the motor and gearbox in the frame of an automobile, comprising four arms projecting from each part, the rear two of which are rigidly fixed to the frame, bell-crank levers, pivoted to the other two arms, the one end of each bell-crank lever being connectd to the frame, and a coupling rod connecting the other ends of the said bell-crank levers, as set forth. The combination with the frame, of a motor, the casing of which is rigidly attached to the said frame at the rear end, two bell-crank levers pivoted to the front end of the casing of the motor, one at each side thereof, the one arm of each bell-crank lever being pivoted to one of the side members of the frame and a rod coupling the other arms of the two bell-crank levers, and the same with the gearbox mounting.

American Marion Sales Co. Petitioned

NEW YORK CITY, Nov. 18—A petition in bankruptcy has been filed against the American-Marion Sales Co., distributer of the Marion cars at 1896 Broadway, by the following creditors: Louis T. Hollister, $628; Betles & Ebsen, $132, and the Auto Supply Co., $31. It was alleged that on November 15 the company admitted in writing inability to pay its debts. Judge Hough appointed C. G. Ludvigh, receiver, bond $1,000, with authority to carry on business for 5 days. The company was incorporated in June, 1911, with capital stock $100,000. F. D. Dorman is treasurer.

BUFFALO, N. Y., Nov. 18—Federal Judge John R. Hazel, in United States district court here, has appointed Harris S. Williams, of Buffalo, receiver for the Greyhound Motor Co. under $2,500 bond. Charges of insolvency and preferential payment were made in an involuntary petition in bankruptcy against the company recently filed, in which liabilities of over $10,000 were alleged. The petitioners were the American Body Co., Beals & Co., and the H. D. Taylor Co.

ANDERSON, IND., Nov. 14.—The first meeting of the creditors of the Nyberg Automobile Works, which was adjudged bankrupt on October 24, 1913, will be held on November 28, when they may prove their claims, examine the bankrupts, appoint a trustee, and transact other business.

Stephenson Assets Double Liabilities

MILWAUKEE, WIS., Nov. 15—The Stephenson Motor Truck Co., of South Milwaukee, Wis., has filed schedules of its assets and liabilities in the proceedings brought by creditors to adjudicate the corporation bankrupt. Assets are given at $37,306.83 and liabilities at $15,576.77. The company several months ago lost its suit against the J. I. Case T. M. Co., of Racine, for $150,000 damages on charges of breach of contract and thereafter discontinued operation of its plant because its selling organization was disintegrated, having been dropped after the Case company took over its output for a certain period with an option to purchase the plant.

Bids $86,000 for Milwaukee Motor Plant

MILWAUKEE, WIS., Nov. 19—The plant of the Milwaukee Motor Co., which went into bankruptcy in the early part of July of this year, will probably be sold to a Chicago wrecking company, which bid today $86,000 for it. It is expected that the court will approve the sale. The known assets of the company were listed at $325,541.36, while its liabilities were $340,459.92.

TORONTO, ONT., Nov. 15.—The Independent Tire Co., Toronto, Ont., issues a statement reporting net earnings for October equal to a dividend of 30 per cent. on the total paid-up capital. The factory has not yet reached half of its maximum output. The factory, which has a capacity of 500 tires a day, has been in operation since the beginning of the summer.

To Test New California Law

Motoring Public Feels That It Is Being Subjected to Double Tax —Will Give It Court Test

SACRAMENTO, CAL., Nov. 12—There is little doubt that the California law enacted at the last session of the legislature and which becomes effective on January 1, 1914, must stand a court test to prove its constitutionality. Most of the provisions of the law were endorsed by the California State Automobile Association and the Automobile Club of Southern California, in fact many of the clauses were framed by the legal staff of the latter organization.

The bill as originally presented to the legislature provided for an annual registration fee of $3, but when it was passed this clause was amended so as to read that the State Treasurer collect fees as follows:

For the registration of every automobile of 20 horsepower and above, but less than 30 horsepower, $10. For the registration of every automobile of 30 horsepower and above, but less than 40 horsepower, $15. For the registration of every automobile of 40 horsepower and above, but less than 50 horsepower, $20. For the registration of every automobile of 50 horsepower and above, but less than 60 horsepower, $25. For the registration of every automobile of 60 horsepower and above, $30.

The half of the collections retained by the State is to be utilized for the maintenance of highways already constructed.

While a large percentage of the motoring public in California spoke kindly on the plan of distribution of the fees collected, they feel they are being subjected to a double tax upon their cars, for they will not only be compelled to pay the State registration fee, but they must also stand a personal property tax on the same car.

Court Holds Warnes Law Invalid

COLUMBUS, O., Nov. 15—The decision of Judge Kinkead in the Franklin County Court last week has a far-reaching effect on motorists in Ohio. The decision in fact enjoined Secretary of State Graves from collecting the registration fees, based on horsepower of motor vehicles as prescribed in the Warnes automobile law which was to become effective January 1, 1914. The injunction was allowed on the grounds that it was double taxation and that more fees were required than were necessary to pay the operating expenses of the state automobile department.

There is a great question if the decision really affected the old automobile law and if that statute still stands. The old law, providing for a flat rate of $3 for electrical vehicles and $5 for gasoline vehicles, was supposed to have been repealed after January 1 by the new law. While the court did not make a decision on that question the consensus of opinion is that the old law was really repealed and that after January 1 there will be no registration law on the statute books of Ohio, unless the decision of Judge Kinkead is reversed by the higher tribunals.

The officers and attorneys of the Ohio Automobile Association which fought the case against the horsepower law advise that no registration fees of any sort be paid as long as the injunction suit is pending. What will be done in the future is a question to be taken up when the time comes.

In his decision it was shown that the cost of registering each and every automobile in the state is 83 cents and that fees from $6 to $18 are entirely unreasonable and illegal.

Talk on Uniform Automobile Laws

NEW YORK CITY, Nov. 19—There is to be a meeting of state commissions for uniform motor vehicle legislation in this city Friday, at which will be state commissioners from the New England and Middle Atlantic States. They will take up the subject of framing uniform laws for all this eastern section of the country. The Associated Automobile Clubs of New Jersey, the A. A. A. body in that state, suggested through its chairman, J. H. Wood, the following points to be adopted as New Jersey's stand:

First—An unlimited tourist privilege.

Second—A license fee only sufficient to cover the cost of registration and conduct of the N. J. State Motor Vehicle Dept.

Third—Drivers' licenses to be issued only to those of good character and physical condition that would enable them to drive properly.

Fourth—A maximum speed limit of 30 miles an hour, with no other speed restrictions that require the driver to drive at all times with due regard to public safety.

Fifth—The gradual elimination of grade crossings on all of our improved highways and until such time the installation at once at every grade crossing of signal devices which are absolutely reliable.

Chairman Wood contends that the present licensing tax of an automobile in New York is unconstitutional because it is a tax in addition to the personal property requirements. While this point has been adversely passed upon by the New Jersey State courts it has been recently upheld by the Supreme Court of Mississippi. In Ohio at the present time a similar case is being taken through its State courts. The New Jersey case is to be passed upon by the United States Supreme Court, whose decision would settle the matter for all time and cover the entire country.

Want Speed Limit of 25 Miles

BOSTON, MASS., Nov. 14—The Massachusetts Highway Commission has intimated that next year it will again make an attempt to put through the 25-mile-an-hour speed limit that fell through this year. It is held that a flat rate would be a good thing to check speeding. Last session the bill got by the committee and into the Legislature where it was killed. It is believed that if the commission allowed it to be 30 miles an hour that the motor opposition would not be so strong against it. There may be a compromise.

MILWAUKEE, WIS., Nov. 15—The Milwaukee common council has passed the headlight ordinance drafted by the Milwaukee Automobile Club, which prohibits the use of headlights on all vehicles, the direct rays of which lights shall strike the roadway more than 200 feet ahead of the vehicle, and prohibits the use of navigator's lights or red and green combinations on the front of vehicles.

Twenty-Four Counties Report No Fines

NEW YORK CITY, Nov. 17—The report of automobile fines turned into the State treasury during the fiscal year ending October 1 last makes the amazing disclosure that twenty-four counties out of sixty-one in New York State failed to turn over a single dollar. It also shows that twenty-two counties have failed to report a single fine for automobile violations since the Callan law became effective in 1910.

Studebaker Delivery Car Has Electric Starter

DETROIT, MICH., Nov. 19—Work has been begun in the factory of the Studebaker Corp., on a delivery car embodying for the first time in a gasoline motor used commercially, the principles of electric starting and electric lighting. Deliveries are promised in a few weeks. The new car is built on a special chassis, differing considerably from that used for passenger cars. The springs are of extra size and the frame is of extra-heavy steel and straight. Motor is the same as that in the Studebaker four but is equipped with a governor which will prevent the car being driven at a greater speed than that specified by the owner. It has a floating rear axle, equipped with Timken roller bearings. It is equipped with 34 by 4.5-inch pneumatic tires. Left steering and center control are used. The car will be furnished with panel body or with express body and canopy top at $1,150.

MARSHFIELD, WIS., Nov. 15.—Stockholders in the Augustyn Rotary Valve Engine Co., Marshfield, Wis., have effected a permanent organization by the election of the following officers: President, Dr. G. L. Harrington; vice-president, Charles K. Herrick; secretary, Henry E. Hoerl; treasurer, R. J. Strauss; directors, Edward Augustyn, Frank Trudeau and John McDonnell. No definite plans for the production of the new motor have been made as yet, but the promoters are at work on the proposition of establishing a plant.

CHICAGO, ILL., Nov. 17—The Woods Motor Vehicle Co. has appointed H. L. Goodwin as general sales director, with headquarters at the general office of the company at this city. W. A. Simonson is announced as general sales manager in personal charge of the distributing agencies throughout the United States.

NEW YORK CITY, Nov. 18—S. J. Wise & Co., Inc., the Eastern distributor of the Paige-Detroit and the Touraine Six have moved to larger quarters, now occupying both floors of the premises, 235 West Fifty-eighth street, just east of Broadway.

Premier Increases Capital $500,000

Introduction Last Year of Premier Little Six Has Caused Great Increase in Business, Hence Requirement for Additional Capital

INDIANAPOLIS, IND., Nov. 17—*Special Telegram*—At a meeting of the interests comprising the Premier Motor Mfg. Co. in Indianapolis last Saturday negotiations were completed that have brought to this concern increased capital in the sum of $500,000, thus making available means for handling the increased business of the company. This company commenced the manufacture of automobiles 10 years ago, starting with modest capital and gradually increasing its output with each succeeding year. It has for years been regarded as one of the substantial and important factors in the trade and was one of three or four concerns, which, as early as 1906, foresaw the demand for six-cylinders now practically universal among the high grade cars. With the introduction last year of a car now known to the trade as the Premier little six, the business of the company has doubled. Hence, the demand for increased capital.

$1,000,000 Tractor Co. Formed

WINNIPEG, MAN., Nov. 10—The formation of the Canadian Bull Tractor Co. Ltd., was recently completed. The capital stock of the company has been fixed at $1,000,000, but of this amount only $200,000 will be issued at the present time, a later call being made when the arrangements are completed for the erection of the Canadian factory, which will be done as soon as the directors have settled upon a location. It is not known at present whether the factory will be located in Eastern or Western Canada, but there is a strong sentiment in favor of locating at Winnipeg, where the company would be in a first-class position not only to obtain material and supplies but also to market their commodity.

The inventor of the Bull tractor, D. S. Hartsough, of Minneapolis, is taking a big block of stock in the new company in return for his patent rights and will supervise the erection and equipment of the Canadian factory.

As showing the demand which exists for a machine similar to the Bull tractor which sells in Canada for $485, no less than 1,262 actual orders were on the table when the directors' meeting took place on November 7, and every mail brings fresh orders and demands for agency contracts. The officials of the company are as follows:

President, W. H. McWilliams; vice-president, A. R. Hargraft; secretary-treasurer, J. S. Loudon; directors, W. J. Cummings, Roy M. Wolbin, Walter Pace, L. A. Cannon and H. F. Williams.

The company announces that it will be ready to make delivery of tractors by next February and the first orders will be filled from the Minneapolis factory which will take care of all Canadian business, pending the completion of the Canadian factory.

Cole Has $1,000,000 Increase

INDIANAPOLIS, IND., Nov. 14—Quarterly statistics of the industry show that the Cole Motor Car Co., had an increase of $1,000,000 during the first quarter of the 1914 season over the corresponding period of last season. The first quarter, figures of which have just been compiled, includes July, August and September.

KENOSHA, WIS.—The income tax roll of Kenosha corporations, just filed by the state tax commission, shows the Thos. B. Jeffery Co. to be one of the three largest income taxpayers in Kenosha. A tax of $13,655.96 is levied against the Jeffery company on its 1912 income, payable at the beginning of 1914. The Badger Brass Mfg. Co. of Kenosha, maker of Solar lamps, is listed on the tax roll as being required to pay $3,303.12 on its net income for 1912.

General Motors Elects New Directors

NEW YORK CITY, Nov. 18—At the annual meeting of the General Motors Co., R. F. Herrick and C. S. Mott were elected directors to succeed the late A. N. Brady and A. H. Green, Jr., resigned. The other directors were re-elected. They were: Joseph Boyer, E. W. Clark, W. C. Durant, J. H. McClement, E. D. Metcalf, M. J. Murphy, C. W. Nash, Thomas Neal, Albert Strauss, J. J. Storrow, N. L. Tilney, and Jacob Wertheim.

The newly elected board organized by electing the same officers as last year, viz., C. W. Nash, president; Thomas Neal, chairman of the board of directors; J. J. Storrow, chairman of finance committee; W. C. Durant, vice-president; E. W. Clark, vice-president; Standish Backus, secretary, and J. T. Shaw, treasurer.

C. W. Nash, president of the company, stated that the cash receipts from the sale of cars during the present fiscal year, which began on August 1, have exceeded last year by $4,500,000 and the cash position of the company was $2,000,000 stronger than at the corresponding time last year.

Walpole Receivers Issue Balance Sheet

BOSTON, MASS., Nov. 14—Receivers for the Walpole Tire & Rubber Co. have issued a general balance sheet as of August 2, which shows assets as follows: Invested assets, $2,311,462; current assets, $847,343; deferred items, $126,818; contingent assets, $276,079; deficit, $977,205. Total, $4,539,507.

Liabilities: Preferred stock, $1,801,300; common stock, $1,500,000; coupon notes, $50,933; current liabilities, $907,595; deferred items, $3,000; contingent liabilities, $276,679; total, $4,539,507.

Of the invested assets, $500,000 is in stock of subsidiary companies at par, while $841,998 is designated patents, trade-marks and good will. Of contingent assets, $276,679 are notes receivable, assigned or discounted at banks and offset by deferred liabilities. On appraisement, the company has $3,285,622 of assets, current liabilities of $910,000, and notes outstanding $51,000. This gives net assets of $2,324,622, against which is issued $1,800,300 preferred and $1,500,000 common stock.

New Indianapolis Cyclecar

INDIANAPOLIS, IND., Nov. 14—The Warren Electric and Machine Co., Indianapolis, will soon place a cyclecar on the market, the fourth Indianapolis concern to undertake a similar proposition. The cyclecar has been designed by E. A. Shelley and Theodore A. Meyer. It will be equipped with a 9-13 horsepower Spacke de Luxe motor and will have a number of innovations. Among these will be a short non-flap driving belt system, a V-shaped underslung frame, a three-to-one steering reduction mounted in the post and a clockwise spiral cranking arrangement designed to handle the high compression with ease.

Will Manufacture Parts for Cyclecars

MINNEAPOLIS, MINN., Nov. 18.—The Minneapolis Motor Co. is making several changes in its various departments and increasing its manufacturing facilities which will place it in a position to furnish steering knuckles, axles, etc., for cyclecar makers.

Cheaper Gasoline in Missouri

ST. LOUIS, MO., Nov. 17—The price of gasoline in Missouri has been cut from 17.5 to 14.5 cents per gallon as the result of business rivalry between the Standard Oil Co., of Indiana, and the Pierce Oil Co., of Texas. This cut in price was made on November 10 by the Standard interests and the following day a similar reduction was made by the Pierce corporation.

R. C. H. Affairs Still Unsettled

DETROIT, MICH., Nov. 17—A meeting of the creditors of the R. C. H. Corp., declared bankrupt November 5, was held with the Referee in Bankruptcy, Lee Joslyn, on Monday, November 17, at which it was shown that little or nothing will be recovered by these creditors of the defunct concern who on October 25, 1912, agreed to waive their claims in favor of corporations which

would supply materials to continue the business under a creditors' committee. These creditors are the largest creditors and represent claims to the amount of $1,372,259, and in waiving this amount the intention was to put the concern back on its feet as a going proposition so as to get all of their money back. The preferred creditors who have claims to the amount of $270,777 and those who did not sign the agreement of a year ago with claims of $24,380 will in all probability get from 40 to 75 cents on the dollar, according to the developments at the meeting, when Referee Joslyn gave it as his opinion that not more than $400,000 will be realized from the sale of the factory property and from the profits which have come under the management of the creditors. As a going concern, the R. C. H. Corporation would sell for about $1,000,000, according to the referee. Its assets are appraised at $1,346,882.

Referee Joslyn refused to confirm the sale of November 6 when the property was auctioned by the Security Trust Co., receiver, and a bid of $135,000 received. The receiver opposed the acceptance of this bid, and the referee and creditors agreed that the amount was far too small. Harris Bros. Co. guaranteed $140,000 for the fixtures and $60,000 for the land. This means that if the bid is accepted, creditors will get at least $200,000 and as much more, minus commission, as the Harris company is able to realize from liquidating the property.

The Security Trust Co. was made trustee. The meeting was adjourned until November 22, and further bids will be received up to that time.

Electric Buses for New York

NEW YORK CITY, Nov. 14—The Peoples' Five Cent Bus Co., has asked for a franchise to run electric omnibuses on Manhattan Island, New York City, as far north as 190th street, charging a 5-cent fare. Their request is being fought by the interests of other bus companies which charge a 10 cent fare. The Electric Vehicle Association of America is lending its support to the new company. Thos. A. Edison, through his business representative, Miller Reece Hutchinson, has entered the campaign, claiming that the electric motor will displace all other types of motors for traction in cities, due to its noiselessness as well as the odorless feature of the electric vehicle.

Englebert Cuts Tire Prices

NEW YORK CITY, Nov. 19—E. W. Elverson, president of the Englebert Tyre Co., American representatives of Englebert Fils and Cie, of Liege, Belgium has announced a new price list as the result of the recent tariff reductions in tires. The new list includes a material reduction in price on all sizes. Tires of the popular sizes for instance, have been reduced as follows:

Size	Old Price	New Price
34 by 4	$41.00	$34.70
36 by 4	43.00	35.90
35 by 5	59.50	51.80

Crown Goes to Hamilton

LOUISVILLE, KY., Nov. 17—The Crown Motor Car Co., manufacturer of the Crown 30, listed to sell for $385, will move to Hamilton, O. Officers of the concern are now in that city making arrangements for the removal. The concern has a paid-in capital of $500,000. B. F. Lambert is president of the company. The Crown was first developed in the Buckeye Mfg. Co.'s plant at Anderson, Ind. Before the concern leaves Louisville it is planned to turn out 150 cars from the plant.

Automobile Securities Quotations

There was more activity in this week's automobile securities quotations. Ajax-Grieb Rubber Co. common and preferred rose 50 and 2 points, respectively. Consolidated Rubber common dropped 2 points and the preferred rose 5. The common stock of the Firestone Tire dropped 10 points; Lozier common dropped 5, while the Miller Rubber dropped 10. Both the common and preferred of the Peerless Motor Co. dropped 10 points. The preferred of the Pope Mfg. Co. dropped 4.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	180	200	200	215
Ajax-Grieb Rubber Co., pfd	98	102	96	102
Aluminum Castings, pfd	100	102	98	101
Chalmers Motor Company, com	..	..	..	98
Chalmers Motor Company, pfd	..	..	..	96
Consolidated Rubber Tire Co., com	11	14	28	33
Consolidated Rubber Tire Co., pfd	50	60	90	94
Firestone Tire & Rubber Co., com	285	288	250	255
Firestone Tire & Rubber Co., pfd	105½	107	103	104
Garford Company, preferred	99	100	80	90
General Motors Company, com	35	36	36	37½
General Motors Company, pfd	76¾	78	74	76
B. F. Goodrich Company, com	71	72	18¼	19
B. F. Goodrich Company, pfd	107	107¾	80½	81½
Goodyear Tire & Rubber Co., com	412	415	225	230
Goodyear Tire & Rubber Co., pfd	104½	105½	96	97½
Gray & Davis Co., preferred	..	..	96	102
Hayes Manufacturing Company	..	90	..	..
International Motor Co., com	20½	22½	..	5
International Motor Co., pfd	74	78	..	15
Kelly-Springfield Motor Truck Co., com	..	..	50	60
Kelly-Springfield Motor Truck Co., pfd	..	..	90	101
Lozier Motor Company, com	..	..	10	16
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., common	..	..	2½	3
Maxwell Motor Co., 1st pfd	..	..	20	21½
Maxwell Motor Co., 2nd pfd	..	..	6	7
Miller Rubber Company	143	147	120	130
New Departure Mfg. Co., com	..	..	168	171
New Departure Mfg. Co., pfd	..	..	103	107
Packard Motor Company, pfd	105¼	107½	90	94
Palmer & Singer, pfd	..	..	..	65
Peerless Motor Company, com	..	..	15	25
Peerless Motor Company, pfd	..	..	75	85
Pope Manufacturing Company, com	26	29	1	3
Pope Manufacturing Company, pfd	71	73	10	20
Portage Rubber Co., com	..	..	..	35
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	8¾	9½	6	7½
Reo Motor Car Company	19	21½	15	16¼
Rubber Goods Mfg. Co., pfd	105	108	100	106
Russell Motor Car Co., com	..	..	..	40
Russell Motor Car Co., pfd	..	..	..	70
Splitdorf Electric Co., pfd	..	..	50	55
Stewart-Warner Speedometer Co., com	..	..	55	60
Stewart-Warner Speedometer Co., pfd	..	..	94	98
Studebaker Company, com	42	44	16	17½
Studebaker Company, pfd	94½	96½	66½	69
Swinehart Tire Company	99	101	78	80
U. S. Rubber Co., common	..	..	53½	54½
U. S. Rubber Co., 1st pfd	..	..	99¾	100
Vacuum Oil Co	..	..	174	177
White Company, preferred	105	108	104	110
Willys-Overland Co., com	..	..	64	66
Willys-Overland Co., pfd	..	..	84	92

Market Changes of the Week

There were quite a few changes this week in prices. Bessemer and Open-Hearth steels both dropped in prices, the former $1.50 and the latter $2.00 per ton. In the local market at the latter part of the week, the principal feature of interest was the further liquidation of electrolytic holdings by one operator resulting in sales of about 1,000,000 pounds at $0.15 1-4 for export to Europe following additional small sales aggregating 1,000,000 pounds at the same price. The market is still weak with very little inquiry from domestic consumers. The advance of price of tin at London on Monday of $8.50 was reported to be due to American advices of expected large deliveries during the current month. Tin closed on Tuesday at $40.18, at a gain of $0.33 per ton. Lead was steady but dull. It dropped this week to $4.30 per 100 pounds, at a loss of $0.05. There were a few changes in the oil markets such as a drop of $0.02 for lard oil, a drop of $0.02 for linseed oil, a drop of $0.01 for rapeseed oil, and a rise for cottonseed oil of $0.03 per barrel. The principal event in the crude rubber trade on Tuesday was the opening of the fortnightly auction of plantations in London. The prices realized showed an advance over those secured at the sale 2 weeks ago. Fine Up-River Para rose $0.03, while automobile tire scrap dropped $0.02 1-8. Raw Japan silk had a rise of $0.03. The general tone of the week throughout the various markets was one of depression.

Material	Wed.	Thurs.	Frl.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb	.06¼	.06¼	.06¼	.06¼	.06¼	.06¼	.....
Beams & Channels, 100 lbs	1.56	1.56	1.56	1.56	1.56	1.56	.....
Bessemer Steel, tons	22.50	22.50	22.00	22.50	21.00	21.00	—1.50
Copper, Elec., lb	.15¾	.16⅛	.16⅝	.15¼	.15⅛	.16⅛	+ .00⅝
Copper, Lake, lb	.16	.16¾	.16¾	.15½	.15⅜	.16⅜	+ .00⅝
Cottonseed Oil, lb	6.88	6.88	6.88	7.04	7.06	7.01	+ .03
Cyanide Potash, lb	.19	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden, Brown	.38	.38	.38	.38	.38	.38	.....
Gasoline, Auto, 200 gals	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime	.95	.95	.95	.93	.93	.93	— .02
Lead, 100 lbs	4.35	4.35	4.35	4.30	4.30	4.30	— .05
Linseed Oil	.50	.50	.50	.48	.48	.48	— .02
Open-Hearth Steel, ton	23.00	23.00	23.00	23.00	21.00	21.00	—2.00
Petroleum, bbl., Kansas, crude	1.03	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.64	.64	.64	.64	.62	.63	— .01
Rubber, Fine Up-River Para	.76	.73	.74	.79	.79	.79	+ .03
Silk, raw Italy	....	5.20	....	....	5.20	5.20	.....
Silk, raw Japan	....	4.05	....	....	4.05	4.08	+ .03
Sulphuric Acid, 60 Baumé	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb	39.85	40.45	40.42	40.00	39.85	40.18	+ .33
Tire Scrap	.08⅛	.08⅛	.08¼	.07	.06	.06	— .02⅛

Springs Division of S.A.E. Meets

Active Program of Standards Committee Meeting To Consider Work of Important Committees Announced

NEW YORK CITY, Nov. 19—Yesterday the Leaf Spring Division of the Standards Committee of the S. A. E. held a session. The discussion lasted about 3 to 4 hours in which Messrs. Pope, Stokes and Newkirk took part. To What Extent Can Springs Be Standardized for Automobile Use? was one of the chief topics discussed.

A new policy for committee meetings was adopted. Hereafter, there will be two meetings a week for the divisions and four meetings a year for the Standards Committee. Next week there will be a meeting of the Motor Casting Division. On Tuesday, November 25, the Electric Equipment Division will meet and A. R. Riker will be chairman. On December 3, in the morning, the Truck Standards Division will meet with W. B. Kennedy as chairman. The Miscellaneous Division will meet in the afternoon, with Arthur Holmes, chairman. On December 10, in the morning there will be a Council Meeting, and the afternoon will be devoted to the Ball and Roller Bearing Division, with David Fergusson, as chairman. Tuesday morning, December 16, the Pleasure Car Rim Division will meet with Henry Souther as chairman, while in the afternoon T. V. Buckwalter, will be chairman at the meeting of the Sheet Metal Division.

Two subjects of exceptional interest to the automobile engineer will be dealt with at the regular November meeting of the Metropolitan Section, at the headquarters of the S. A. E., Wednesday evening, November 26. Silent and roller chains, will be discussed by J. R. Cautley, who has made a special study of the subjects, and who, from residence in England, is thoroughly familiar with foreign practice along this line. Inlet manifolds will be discussed and illustrated by Arthur B. Browne. This subject will be a fitting introduction to the December meeting, at which it is planned to offer papers on Heavy Fuel Carbureters and Vaporizers. The date will be announced in ample season.

Hoosier S. A. E. Discusses Electric Starter

INDIANAPOLIS, IND., Nov. 17—An interesting meeting of the Indiana section of the Society of Automobile Engineers was held in the rooms of the Hoosier Motor Club, Indianapolis, on the evening of November 11, the subject under discussion being "Power Application of Electric Starters to Gasoline Engines." The branch has seldom had so many recognized experts to participate in the discussion at any one meeting. Forceful papers on the subject were read by S. Deutsch, of the Detroit Electric Appliance Co., Detroit, Mich.; T. L. Lee, of the Northeast Electric Co., Rochester, N. Y.; F. E. Moskovics, of the Jones Electric Starter Co., Chicago, Ill.; C. M. Tichenor, of the Gray and Davis Co., Boston, Mass., and S. W. Rushmore, of the Rushmore Dynamo Works, Plainfield, N. J.

NEW YORK CITY, Nov. 15.—The November meeting of the Motor Truck Club at the Hotel Cumberland, Wednesday evening, November 19, will consider the question of motor trucks and the coal trade. The annual meeting and election of officers will be held on December 17.

National Gas Engine Assn. Meets Dec. 4

TOLEDO, O., Nov. 15.—The sixth annual meeting of the National Gas Engine Assn. will be held on December 4 at the Boody House, this city, and will last to December 6. On Friday, December 5, Jos. A. Anglada, M. E., will give a discussion on standardization. On the last day G. W. MacEdwards will talk on What the Customer Wants in Lubrication, and F. E. Whittlesey's paper will be Springs and Their Relation to the Gas Engine.

NEW YORK CITY, Nov. 18.—At the regular quarterly meeting of the board of governors of the Manhattan Automobile Club, Inc., last week, the resignation of L. W. Bennett, as secretary and treasurer, and member of the executive committee was accepted. W. A. Allen was elected to occupy the office previously held by Mr. Bennett. A. J. Inderrieden's resignation as a member of the board of governors was also accepted. He tendered his resignation because of an extended absence in New Mexico. His membership in the board of governors was filled through the election of Horace de Lisser.

National Assn. of Purchasing Agents Formed

NEW YORK CITY, Nov. 14—The formation of an organization of purchasing agents and buyers was consummated at the Hotel McAlpin, recently. This new organization will be known as the National Assn. of Purchasing Agents. It will be devoted entirely to the interest of purchasing agents and buyers, and will have sub-associations in all sections of the country. Its headquarters are temporarily at the Hotel McAlpin, this city.

LaVigne Enters Cyclecar Field

DETROIT, MICH., Nov. 19—J. P. LaVigne, who constructed a light car listing at $375 a number of years ago, has entered the cyclecar field with a car of his own design known as the LaVigne. This car will have a four-cylinder air-cooled motor, an underslung frame, sliding gear transmission, 50-inch tread and 96-inch wheelbase. It will weigh 600 pounds and will list at $425.

No Ford Speedometer Equipment

DETROIT, MICH., Nov. 18.—The Ford Motor Co. will not equip its cars with speedometers. An allowance of $6 is made to purchasers on the cars not equipped with speedometers.

NEW YORK CITY, Nov. 18.—George H. Smith has been appointed general manager of the Peerless M. C. Co., of New York. H. T. Birnie has been appointed assistant manager of the branch.

Court Decides for Rajah in Plug Case

NEW YORK CITY, Nov. 19.—Circuit Judge Ward, of the United States Court of Appeals, has just rendered an opinion in the suit of the Rajah Auto Supply Co. against the Rex Ignition Mfg. Co., sustaining the validity of the Rajah Company's restricted license under which its plugs are sold. The Rajah plugs are sold under a license restriction that no porcelain or other part not made by the Rajah Company shall be substituted in the Rajah plugs. Various dealers have contended that this restriction was not inforcible. The opinion by Judge Ward not only sustains the validity of the Rajah restriction, but holds that it is contributory infringement of the Mills patent No. 825,856 to sell porcelains for substitution in the Rajah plugs, unless those porcelains are made by the Rajah company. The judge granted a preliminary injunction.

Motorist Wins in Collision Case

MILWAUKEE, WIS., Nov. 18—A case of national importance, involving the liability of motorists in cases of collision on public highways, has just been decided in favor of the motorists in federal court at Milwaukee. Mrs. Eliza J. Pringle, of British Columbia, brought suit against Gustav Derrichs, former sheriff of Racine county, Wisconsin, for $10,000 damages. Mrs. Pringle claimed that on June 3, 1912, Derrichs was driving his car along the Burlington road in Racine county and in attempting to pass a horse-drawn vehicle containing Mrs. Pringle and party, he struck the vehicle. Mrs. Pringle was thrown out and injured. She claimed Derrichs did not exercise due diligence and care. It was admitted that the road was narrow. After 15 minutes' deliberation, the federal jury returned a verdict for the defendant, Derrichs, and the suit was dismissed. The verdict found that Derrichs was not guilty of negligence and care nor of contributory negligence.

CLEVELAND, O., Nov. 19—W. A. McDermid has resigned as sales and advertising manager of the Service Recorder Co. to assume a similar position with the Falcon Cyclecar Co. His successor has not yet been appointed.

Boston Electric Show Opens

Nine Makes of Cars and Three Types of Batteries on Exhibition —Twenty-eight Machines Shown

BOSTON, MASS., Nov. 17—Promptly at 10 o'clock this morning the first Electric Motor Car Salon opened here under the auspices of the Electric Motor Car Club. President Day Baker, of the club, escorting ex-president William H. Blood, Jr., of the Electric Vehicle Assn. of America, headed a procession of about forty exhibitors and salesmen into the ballroom of the Copley Plaza hotel where the exhibition is taking place. After making an inspection of the show Mr. Blood was escorted to the alcove where he made a brief address, saying that the opening of the show was the culmination of the efforts of electric men for the past few years, and the spirit of aggressiveness now apparent should be kept up. He said the lesson that this Salon would teach would be far-reaching and effective, and would do much to advance the use of electric vehicles in New England. He concluded by stating that this would be the first of many such exhibitions not only in Boston, but throughout the country. President Day Baker then welcomed the members.

There are nine makes of cars and three types of batteries exhibited. The total number of machines in the hall is twenty-eight. In the evening the Salon makes an attractive appearance, and throughout the opening day and evening there was a good attendance. As the price of admission is $1 and there are no souvenirs, etc., only the people really seeking to get an idea of what electric vehicles are like were visitors. Many women were at the show to-day and they took a lively interest in what was to be seen.

The Rauch & Lang has four models; Detroit Electric four; Waverley four; Baker four; Buffalo-Babcock three; Woods three; Ohio two; Bailey three; Standard one. The greater number are closed broughams or coupés, each exhibitor limiting the open cars to one roadster, except the Bailey, which is showing a touring car with steamline body not unlike one of the gasoline models of 1914. The batteries exhibiting are the Edison, Exide and Philadelphia. There were several representatives from electric light stations in other States at the show to-day and more are expected before it closes.

France Has Many Events Planned

PARIS, Nov. 9—The French Grand Prix is to be held near Lyons on July 4. The announcement of this race under a 4.5-liter rule has aroused a feeling of enthusiasm. Held down to 275 cubic inches, manufacturers taking part in this race will have to study the problem of motor efficiency in its closest details, and the work done in the laboratories and the practical results obtained on the road will have an immense influence on the 1915 models.

The season will open with a cyclecar and light car endurance test around France during the month of February. This event is timely, for it will draw the attention of the public to a popular type of automobile for which there is likely to be an immense demand in the near future. Regularity of running and economy in lubricating oil and gasoline will be the features calling for special attention. During March there will be another reliability and endurance test, of about 4,000 or 5,000 miles around France, this time for medium-priced, full-size touring cars. This event is now a classic. While it is not of primary importance as a test of cars, it is valuable in stirring up interest throughout the country and is recognized by dealers as a help to trade.

As an aftermath to the French Grand Prix there will be a long-distance road race at Le Mans, probably about September. This will unite nearly all the cars having run in the national speed contest. The Coupe de l'Auto race is of particular importance by reason of the reduction of the cylinder area from 3 to 2.5 liters. In making the change it is claimed that all possible lessons have been learned from the 3-liter rules, and, in order to secure further development, it is necessary to still further limit the size of motors. This race will be run, in all probability, at Boulogne toward the end of the summer. Outstanding hill-climbs will be Gaillon and Mont Ventoux; this class of competition is now of far less importance than a long-distance road race. Monaco motor boat races, to be held in April, have a close connection with the automobile industry, for motor boating in France exists only as a means of testing out motors which will later do service on the road.

In the commercial field the event of the year will be the military trials extending over a month and designed to prove what types of vehicles are suitable for army subsidies. This year special attention will be given to four-wheel drive tractors which it is intended to adopt for general military haulage and as a substitute for horses in the handling of heavy artillery. In addition to these trials, there will be a special military competition for four-wheel drive tractors only early in the year. An automobile show in 1914 is already announced. In all probability it will be held during the month of October.

Light Car Trials in England

LONDON, ENG., Nov. 14—A very interesting trial was recently decided through Surrey and Hampshire, in which no fewer than thirty-four light cars and cyclecars competed, and from which one was able to gather much information concerning these cars under running conditions. The course was a severe one, and the road surfaces, consequent upon intermittent rain, rendered the first trial, solely for these machines, the more difficult. The little machines engaged acquitted themselves well and showed remarkable adaptability to adverse conditions. Practically every type was represented, and what trouble occurred was due to minor points. Their ability to negotiate hairpin bends at a fair rate of speed was amply demonstrated, but one could not say that the hill-climbing qualities of these machines were up to the standard expected. The light car proved itself to be a roadworthy machine, and at the close of the run was remarkably clean when one considered the nature of the roads, whereas the cyclecars were very dirty. Inlet valve trouble caused one retirement, while one driver inadvertently changed his gear lever instead of the brake control on a hill and damaged his gearbox. Many experienced trouble with cooling, owing to the hilly nature of the country through which they passed, and those machines which were belt-driven were in difficulties when the rain began to fall heavily. One machine lost one of its two belts, but in spite of this it completed the trial with a non-stop run to its credit. Twenty-eight of the competitors finished and were checked in at the control within schedule time.

TACOMA, WASH., Nov. 14—In the Tacoma *Ledger's* first sociability run to Olympia, the capital of Washington, on Saturday, November 8, Mayor J. P. Lesher, of Olympia, in a Chalmers car, won the first prize, a silver cup. Alex. O. Brenden, in a White, was second; Charles M. Logan, Overland, third; Mrs. O. H. Ridgway, Studebaker, fourth. Eighteen machines took part in the run.

NEW ORLEANS, LA., Nov. 14—Thanksgiving races will be held in New Orleans. This is strictly an amateur event. Races have been arranged for all classes of cars and wide interest is resulting. Prizes are being offered by business men. The judges, timekeepers and all officers having jurisdiction at the races will be women.

Repairer May Hold Car for Payment

MONTREAL, QUE., Nov. 18—That an automobile repairer may retain possession of the repaired car and for this purpose, even place it in storage, until such time as the owner pays his repair bill, was shown by a judgment handed down by Mr. Justice Archer yesterday wherein the Longeuil Riverside Land Co., lost a suit against W. L. Hogg. The car had been repaired by David Parent & Co., but as the owners refused to pay their account, Parent placed the car in storage in a nearby shed owned by Hogg. The Riverside Land Co., getting wind of this one day, promptly took out a *saisie revindication*, and attached the car, and had it taken away by the bailiff. The Parent company alleged that this was a well-thought-out way for the Longeuil Riverside Land Co., people to get their car without paying the repair bill, for it was alleged that the bailiff had since the time of the seizure allowed the car to be used by an official of the company. The Parent company pointed to the repairs made as well as the unpaid bill and finally succeeded in impressing the court with the justice of its claim.

Factory Miscellany

NEW Tire Fabric Factory—Rapid progress is being made on the construction of the buildings for the new Connecticut Cotton Mills plants at Sherbrooke, Que. In another month the building will be practically completed. A start will be made on the roof next week. The plant has long since been ordered and is now ready for shipment and will be on the spot in December. The installation will be made rapidly, and it is expected that the plant be ready for operation early next year. It is hoped that some of the machinery will be operating in January. Tire fabric will be the product.

Warren Secures Standard Plant—The coming of the Standard Automobile Co., of Cleveland, O., to Warren, O., is assured as the last share of stock apportioned to Warren to sell was taken up.

Will Make Forgings—The National Forging Co., Chatham, Ont., recently incorporated, will take over the plant of the Swift Motor Car Co., and will make automobile and carriage forgings, as well as sockets.

Middleby Plant Brings $30,275—The property of the Middleby Auto Co., Reading, Mass., has been sold to J. E. Conant & Co., Lowell, Mass., for $30,275. Some of the machine tools will be exported to England and others to Canada.

May Move to Toledo—The General Metal Work Co., at present operating in Jersey City, under the name of the Miller Metal Work Co., is expected to transfer its plant from that place to Toledo by January 1. The company manufactures the tubular parts of automobiles.

Portage Plant Enlargements—Plans for enlargement of the plant of the Portage Rubber Co., Barberton, O., were recently taken up at a meeting of the directors of the company. The erection of the new addition to the plant now under way is one step in the plan of enlargement contemplated.

Want Jefferson Men Interested—Moore & Schmidt of Cleveland, O., designers of a new automobile, are arranging with the business men of Jefferson, O., to establish a plant in that city for the manufacture of automobiles. Jefferson people will be asked to subscribe $25,000 to the enterprise. E. A. Woodruff of Jefferson will be identified with the enterprise if it is established here.

Ford's Large Columbus Plant—The Ford Motor Car Co., Detroit, Mich., has awarded the contract for the erection of the large assembling plant on Cleveland and Buckingham avenues, Columbus, O., for $156,000. This is exclusive of the plumbing, heating and electrical systems. The work of construction was started at once and will be rushed to completion. It is expected to have the plant ready for occupancy in the spring. The plant consists of a four-story building more than 200 feet in length.

Wisconsin Aluminum's New Plant—The Wisconsin Aluminum Foundry Co., of Manitowoc, Wis., a large producer of motor car engine castings, is moving into its new foundry plant at South Sixteenth and Franklin streets, Manitowoc. The new plant makes its possible to more than double the production. The equipment is new throughout. The site of the plant was donated by the Manitowoc Citizens' Assoc., and is large enough to make possible extensive additions when needed.

Will Manufacture Dreadnought Tires—The Dreadnought Tide & Rubber Co. has been incorporated under the laws of Maryland at $1,000,000 for the purpose of making motor car tires. Operations at the firm's new plant which is located at Orangeville, Baltimore County, Md., will begin January 1. At the start the firm will employ 150 to 200 men while the daily capacity of the plant will start with 300 tires and 300 inner tubes and this will be increased gradually. A. Frank Gilbert is president and Wilmer Dunbar vice-president.

Knight Tire's Plant—Work has been started by the Knight Tire & Rubber Co., Canton, O., on buildings which will more than double the capacity of the plant. The buildings will be erected adjacent to the present plant. There will be two buildings, 75 by 125 feet, three stories high, and one building 55 by 125 feet and two stories high. All will be of reinforced concrete and absolutely fireproof. The floors of concrete will be built to withstand a test strain of 250 pounds to the square foot. The daily capacity of the plant will be 500 tires and 700 tubes a day. The improvements will cost $110,000.

Edison Plant Progressing—The large new plant of the Edison Storage Battery Co. is practically completed and only awaits the installation of machinery to start making the Edison battery on a greatly enlarged basis for electric trucks and pleasure cars, etc. The Edison battery is particularly adapted to miners' safety lamps and will soon be put on the market. This probably caused the rumor that a new battery was to be forthcoming and that manufacture would be curtailed until its development. By the latter part of December it is expected that all the machinery will be received and an addition of over 2,000 new employees required.

Columbia Plant on Market—All machinery in the Columbia Motor Car Co. plant, Hartford, Conn., has been removed to Newcastle, Ind. The Columbia Auto Repair Co. now occupies the repair shop on Park street and John J. Roach is making use of the paint shop pending the completion of a new building on Maple avenue. This week the Britton company purchased all the materials on hand in the big trimming department and removed them to the Allyn street shop. A local electric battery charging station has acquired all the battery fittings and accessories. The big plant is now on the market. There seems to be no immediate prospect of sale.

The Automobile Calendar

Shows, Conventions, Etc.

Nov.	22-29	Providence, R. I., Show, State Armory.
Dec.	6-13	Toledo, O., Annual Show, Factories Bldg., Toledo Auto Shows Co.
Dec.	9-13	Philadelphia, Pa., Annual Convention of American Road Builders' Association.
Dec.	11-20	New York City, First International Exposition of Safety and Sanitation, under the auspices of the American Museum of Safety.
Jan.	2-10	New York City, Importers' Automobile Show, Hotel Astor.
Jan.	3-10	New York City, Automobile Show, Grand Central Palace.
Jan	10-16	Milwaukee, Wis., Sixth Annual Show, Auditorium, Milwaukee Automobile Dealers' Assn.
Jan.	10-17	Cleveland, O., Automobile Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan.	10-17	Philadelphia, Pa., Show, Metropolitan Building, Automobile Trade Assn., H. W. Terry, Secretary.
Jan.	12-17	Bridgeport, Conn., Annual Automobile Show, State Armory, B. B. Steiber, manager.
Jan.	17-24	Pittsburgh, Pa., Annual Automobile Show, Automobile Dealers' Assn.
Jan.	24-31	Montreal, Que., Automobile Show, Passenger Cars, Montreal Automobile Trade Assn.
Jan.	24-31	Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan.	26-31, 1914	Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.
Jan.	31-Feb. 7	Minneapolis, Minn., Automobile Show.
Feb.		Hartford, Conn., Show.
Feb.		St. Louis, Mo., Show.
Feb.	2-7	Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.
Feb.	3-7	Montreal, Que., Motor Truck Show, Montreal Automobile Trade Assn.
Feb.	7-12	Seattle, Wash., Annual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.
Feb.	9-14	Buffalo N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb.	16-21	Kansas City, Mo., Auto Show.
Feb.	21-28	Newark, N. J. Automobile Show, N. J., Auto Trade Assn.
Feb.	21-28	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Feb.	23-28	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Mar.	2-4	Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
Mar.	2 6	Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
Mar.	7-14	Boston, Mass., Automobile Show.
Mar.	9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
March	17-21	Boston, Mass., Truck Show.

Race Meets, Runs, Hill Climbs, Etc.

Nov.	20	San Antonio, Tex., Track Race, San Antonio Auto Club.
Nov.	27	Philadelphia, Pa., Lu Lu Temple Auto Club Run.
Dec.	3-5	New York City, 500-mile Reliability Run, Motor Dealers' Contest Assn.

The Week in the Industry

Motor Men in New Roles

BRISCOE Back This Month—Benjamin Briscoe, former president of the U. S. Motor Co., and now the head of Briscoe Freres, Billancourt, Paris, is to return to the United States this month. He will make headquarters at his New York City office, 7 East Forty-second street. Frank Briscoe will remain in charge of the Paris office of the concern.

Weysz with Horseless Age—H. W. Weysz has joined Horseless Age in the capacity of news editor.

Yuster Resigns from Hess—Sales Manager Yuster, of the Hess Spring & Axle Co., Carthage, O., has resigned.

Worthen Business Manager—W. K. Worthen has taken the position of busineess manager of the Compressed Gas Co., Vancouver, B. C.

Rickel Swinehart Manager—E. S. Rickel has taken the management of the Swinehart Clincher Tire & Rubber Co., Detroit, Mich., succeeding J. W. Cully.

Peabody Louisville Ford Manager—F. H. Peabody, of Boston, Mass., is the new manager of the Louisville (Ky.) branch of the Ford Motor Co., succeeding F. E. Van Patton.

Watson Returns from Europe—T. T. Watson, vice-president of the American Bronze Co., Berwyn, Pa., manufacturer of Non-Gran bearing bronze, has returned from a trip to Europe.

Ferguson with Lyons-Atlas—R. R. Ferguson has been added to the sales force of the Lyons-Atlas Co., Indianapolis, Ind., and will travel the South Atlantic States in the interests of that company.

Stratton Representing Jeffery—G. M. Stratton has been appointed representative for Greater New York and vicinity of the new Jeffery line of cars. His concern will be called the Stratton Motor Co.

Williams with Gramm Truck—E. A. Williams, formerly with the Castle Lamp Co., Battle Creek, Mich., has joined the staff of the Gramm Motor Truck Co., Lima, O. He will be assistant manager of the company.

Smetts with Billings-Chapin—M. A. Smetts, formerly with Power Boating, succeeds L. W. Young as advertising manager of the Billings-Chapin Co., Cleveland, O. This company manufactures paints and varnishes.

Harding Motz Representative—J. V. Harding, formerly Detroit (Mich.) branch manager of the Motz Tire & Rubber Co., is now special representative for this concern. He will retain his headquarters in that city.

Fisher Mogul District Manager—Charles Fisher, formerly with the Universal Motor Truck Co., has been appointed district manager of the Mogul Motor Truck Co., St. Louis, Mo. He will cover the territory east of Chicago and will have his headquarters in New York City.

White Sails for Bombay—Amos White, formerly secretary of the Everett Auto Sales Co., Columbus, O., will sail from New York for Bombay, India, early next month, where he will establish a concern for the purpose of selling and distributing American-made automobiles.

Smith Firestone Manager—A. T. Smith, who has been connected with the Firestone Tire & Rubber Co., lately with the Chicago branch, has been appointed manager of the Los Angeles branch of the company. He succeeds R. D. Barr, who was killed in an automobile accident last July.

Oliphant Visits Austin Plant—Mr. Oliphant, of the Colonial Import Co., Vancouver, B. C., recently left for England on a visit to the factory of the Austin Motor Co. to complete the arrangements made with D. A. Gooch, the Canadian representative of the company, to take over the agency for that city.

Stillwell with Cleveland Co.—W. H. Stillwell, formerly with the J. S. Bretz Co., New York City, has become associated with Joseph Schaeffers, Cleveland, O., as sales manager and engineer in the distribution of imported H. C. B. ball bearings. Mr. Schaeffers has opened headquarters in the Marion building in Cleveland.

Cropley U. S. Tire Manager—F. S. Cropley, formerly district manager of the U. S. Tire Co., with headquarters at Minneapolis, Minn., has been appointed manager of the Louisville, Ky., branch of that concern. H. G. Moesta, who has been in charge of that office for more than a year, has been transferred to the New York City branch.

Morse Chain Inventor Dies—Edward Fleet Morse, inventor of the Morse chain, died in Ithaca, N. Y., on November 11. He was the founder of the Morse Chain Works and through the chain that he invented won considerable fame. The Morse thermo-gauge was also one of his inventions for measuring the temper of steel, which has been adopted by the United States and the German bureaus of standards.

Garage and Dealers' Field

Federal Moves in Boston—The Federal Rubber Mfg. Co. has moved to its new building at 173 Massachusetts avenue, Boston, Mass.

New Vancouver Diamond Agency—The Vancouver Vulcanizing Co., Vancouver, B. C., has obtained the agency for the Diamond Rubber Co.

King Branch Opened—The King Motor Car Co., of Detroit, has opened its salesrooms at Springfield, Mass., at 521 Worthington street. William Vincent is in charge with Mr. Talcott as salesman.

U-S-L as Standard Equipment—The Rochester Motor Fire Pump Co., Rochester, N. Y., manufacturers of automobile fire engines, has selected the U-S-L electric starter and lighter as standard equipment.

Now Handling Savage Tires—Distribution in King and Pierce Counties, Wash., of the Savage tires has been placed in Seattle with a firm in which C. R. Mayburv, H. D. C. Chetlain and E. F. Tawnev are interested.

Midland Stock Moved—The entire stock of repair parts, together with all drawings, jigs, patterns, special tools and records, have been removed to the Philadelphia (Pa.) factory of the Midland Motor Co. at 220 Diamond street.

Cadillac Ships 2,016 Cars—The Cadillac M. C. Co., Detroit, Mich., reports big business in October, having shipped 2,016 cars in that month, of a total value of $4,246,425. Of these 1828 were of the open body type and 188 were closed cars.

Banker Buys an Interest—A. C. Banker, who has been associated with the automobile industry for some years, has just bought an interest in the Cole Motor Co., of Boston, Mass., and he has been appointed general manager of the company.

Cox Opens Chicago Branch—The Cox Brass Mfg. Co., Albany, N. Y., has opened a Chicago (Ill.) branch at 4335 Michigan avenue. These people are manufacturers of shock absorbers, carbon cleaners and other automobile accessories.

Moon Reports Gain—The Moon Motor Car Co., St. Louis, Mo., reports a gain of 52 per cent. in its actual shipment of cars from the factory for the months of August, September and October of this year over the same months of last year.

Copartnership Dissolved—The copartnership existing between G. A. Alexander, Lloyd Kline and Dr. W. F. Herbst, trading under the name of A-K Auto Supply Co., was dissolved by G. A. Alexander withdrawing from the firm. Mr. Alexander is now conducting a business along the same lines at the former address under the name of Alexander Auto Supply Co., Allentown, Pa.

Boston White Company's Opening—The new home of the White Motor Car Co., in Boston was formally opened recently. For 2 days the building was kept open from 8 a. m. to 11 p. m., and both days there was a big crowd present. Vice-president Walter White, and J. A. Harris, Jr., advertising manager, came on from the factory. The new structure is located on Commonwealth avenue, and it covers an acre of ground. It is the most accessible motor building in Boston, for everything is on the one floor. The salesrooms in the front are capable of holding twelve motor cars on one side and ten trucks on the other without crowding. The salesmen have their desks on either side of the main aisle. In the rear is the service department and used car room. On the right manager J. S. Hathaway has his offices.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BOSTON, MASS.—Henderson Motor Co. of New England; capital, $25,000; to deal in automobiles. Incorporators: J. A. Binney, P. B. Chase, E. B. Chapain.

BRYAN, TEX.—Brazos Ford Co.; capital, $3,500; to deal in automobiles. Incorporators: M. R. Newnham, H. O. Boatwright, B. M. Barker.

BROOKLYN, N. Y.—Crescent Taxicab Co.; capital, $5,000; general taxicab business. Incorporators: J. B. Haff, M. L. Haff, Isaac Stone.

BUFFALO, N. Y.—Houck Mfg. Co.; capital, $900,000; to manufacture automobiles. Incorporators: G. W. Houck, E. McM. Mills, C. H. McCullough, Jr.

BUFFALO, N. Y.—Meyer M. C. Co.; capital, $50,000; to deal in automobiles. Incorporators: A. C. Meyer, C. H. Meyer, F. B. L. Stone.

CHICAGO, ILL.—Chicago Great Western M. C. Co.; capital, $15,000; to deal in automobiles. Incorporators: H. Darmstadter, M. Darmstadter, A. J. Schuett.

CHICAGO, ILL.—Luxmore Differential Co.; capital, $7,500; to manufacture and deal in automobiles, accessories and machinery. Incorporators: Edbert Robertson, Lazarus Krinsky, J. L. Anderson.

CHICAGO, ILL.—C. A. Martin Mfg. Co.; capital, $2,000; to manufacture and sell motor vehicles. Incorporators: C. A. Martin, G. T. Glover, William Schulze.

CHICAGO, ILL.—Triple Action Spring Co.; capital, $250,000; to manufacture and deal in springs, mechanical appliances, automobiles, accessories, etc. Incorporators: O. G. Temme, R. H. Mather, C. R. Church.

CINCINNATI, O.—Warner Auto Top Co.; capital, $40,000; to manufacture and deal in automobile and other vehicle tops. Incorporators: W. M. Warner, W. W. Dill, W. G. Dill, K. L. Warner, F. A. Brown.

CLEVELAND, O.—Cleveland Rotary Motor Co.; capital, $1,000; to manufacture rotary motors. Incorporators: Paul Schwan, Jr., C. W. Neubrand, K. L. Mach, A. T. Daniels, J. T. Lind.

DETROIT, MICH.—American Motor Truck Co.; capital, $10,000; to manufacture automobile trucks. Incorporators: A. H. Reinhold, W. K. Ackerman.

DETROIT, MICH.—Federal Rim Co.; capital, $5,000; to manufacture automobile wheels. Incorporators: H. W. Bailey, A. H. Goss, W. D. Mercer.

DETROIT, MICH.—Tulite Auto Bulb Co.; capital, $25,000; to manufacture automobile lamps and electrical fixtures. Incorporators: L. J. Lepper, J. M. Richardson, W. F. Adams.

EAST ROCHESTER, N. Y.—Housel Mfg. Co.; capital, $25,000; to deal in automobiles. Incorporators: W. H. Cole, W. E. Housel, B. B. Housel.

FRANKLIN, PA.—Standard Appliance Co.; capital $250,000; to deal in and with all kinds of self-actuated engine and motor starters for use on all kinds of engines and motors. Incorporators: Q. D. Hastings, D. Donizi, F. B. Shilien.

LUDLOW, KY.—Eureka Resilient Wheel Co.; capital, $10,000; to manufacture a patented automobile wheel. Incorporators: G. A. Simpson, Charles Schroeder.

MASON CITY, IA.—Standard Motor Co.; to manufacture automobiles. Incorporators: C. H. McNidder, F. E. Konasten, M. J. Scanlon.

NEW YORK CITY—Power Boat Engineering Co.; capital, $10,000; to manufacture motors, motor boats. Incorporators: R. S. Mills, E. W. Graef, C. L. Turner.

NEW YORK CITY—C. E. Riess & Co.; capital, $50,000; to deal in automobiles. Incorporators: C. E. Riess, G. L. Riess, B. H. Riess.

NEW YORK CITY—H. Scott Johnston Co., Inc., capital, $3,000; to deal in automobiles. Incorporators: H. Scott Johnston, W. A. Hall, Adolph Kornblum.

OWENSBORO, KY.—Central Motors' Co.; capital, $1,000; to deal in automobiles. Incorporators: Elmer Little, Wm. R. Cavin, B. J. Cavin.

RUSHVILLE, IND.—Power Transmission Clutch Co.; capital, $30,000; to manufacture power transmission clutches. Incorporators: John Wiley, O. E. Woodbridge, J. J. Striegel.

ST. JOSEPH, MO.—St. Joseph Automobile Show Assn.; capital $2,000; to run automobile shows. Incorporators: E. T. Rhodus, M. N. Hall, H. C. Davis.

TACOMA, WASH.—Universal M. C. Co.; capital, $25,000; to deal in automobiles. Incorporators: W. C. Baldwin, R. A. Mueller, E. M. Baldwin.

UTICA, N. Y.—Xardell Bros. Co.; capital, $1,000; to manufacture automobile supplies. Incorporators: J. A. Xardell, C. A. Xardell, W. K. Teffey.

WAPAKONETA, O.—Breese Motor Plow Co.; capital, $100,000; to manufacture motor plows. Incorporators: G. R. Morris and others.

WINDSOR, ONT.—Parsons M. C. Co. of Canada, Ltd.; capital, $500,000; to manufacture automobiles. Incorporators: T. G. Ellis, A. J. Denomy.

GARAGES AND ACCESSORIES

CHICAGO, ILL.—Abbott Garage and Machine Co.; capital, $32,000; general garage business. Incorporators: J. C. Abbott, M. E. Boynton, H. L. Hudson.

CHICAGO, ILL.—South Chicago Garage; capital, $2,500; general garage business. Incorporators: Fred Poulecka, F. M. Koch, Anna Poulecka.

CINCINNATI, O.—Franklin Automobile Co.; capital, $20,000; to buy and sell and rent automobiles and to operate a garage. Incorporators: Newman Samuel, R. C. Anderson, F. H. Augederbeche, J. C. Lueders, J. Frederick Koch.

DALLAS, TEX.—Adolphus Auto Rent Co.; capital, $15,000; to rent automobiles. Incorporators: T. Bower, C. L. Bower, T. A. Pitman.

JOLIET, ILL.—Auto Specialty Co.; capital, $2,500; to deal in automobile accessories. Incorporators: F. D. Byrd, F. W. Walter, R. W. Walsh.

NEW YORK CITY—Lock Robe-Rail Co.; capital, $5,000; to manufacture and deal in automobile accessories. Incorporators: C. W. Crow, W. G. Grichton, R. W. Johnson.

NEW YORK CITY—Mott Haven Garage Co.; capital, $1,000; general garage business. Incorporators: F. J. Hinners, Katherine Hinners, J. P. Indorf.

NEW YORK CITY—Pheufiller Tire Co.; capital, $1,000; general tire business. Incorporators: F. Eder, H. L. Hill, Max Monfried.

NEW YORK CITY—State Auto Repair and Sales Co.; capital, $5,000; to repair automobiles. Incorporators: R. Kaiser, L. J. H. Schmitt, A. Larnett.

NEW YORK CITY—Washington Taxi Service, Inc.; capital, $500; general taxicab business. Incorporators: Harry Rieders, Abr. Bernstein, Jos. Brucker.

ST. LOUIS, MO.—Bond Auto Co.; capital, $10,000; to erect an automobile repair plant and garage. Incorporators: M. N. Bond, Charles Kist, C. Bond.

SUMNER, ILL.—Alpha Oil Co.; capital, $7,500; to deal in oils. Incorporators: M. May, D. C. Standinger, B. F. Hockman, G. R. Emerick, C. H. Saxton, G. Will McNeece.

TRENTON, N. J.—Asbestos & Rubber Works of N. J.; capital, $50,000; to manufacture asbestos and rubber goods. Incorporators: J. H. Scudder, J. M. Scudder, J. A. Whiteney.

WALTERBORO, S. C.—Walterboro Garage Co., Ltd.; capital, $1,000; general garage business. Incorporators: P. H. Wichman, P. J. Lucas, A. H. Wichman.

WINCHESTER, MASS.—Mystic Valley Garage, Inc.; capital, $25,000; general garage business. Incorporators: G. Goddle, N. Goddle, R. W. Burnes.

CHANGES OF NAME AND CAPITAL

CLEVELAND, O.—Standard Truck Co.; capital increased from $5,000 to $50,000.

COLUMBUS, O.—F. E. Avery, change of name to F. E. Avery & Son.

ST. LOUIS, MO.—Meyer-Busch M. C. Co.; change of name to the A. H. Meyer M. C. Co.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Akron, O.	Crow	C. W. Rodrick
Albany, N. Y.	Oakland	W. L. Schupp & Sons
Asheville, N. C.	Jeffery	A. H. McCormick
Ashland, O.	Crow	Wicks & Donley
Assumption, Ill.	Partin-Palmer	C. R. Heiserman.
Atlantic City, N. J.	Oakland	S. T. Zelley
Atlantic City, N. J.	Republic	Eastern M. C. Co.
Baltimore, Md.	Best	H. Darwin Howell
Baring, Me.	Jeffery	Edward Chase
Beecher, Ill.	Jeffery	Herman Bockelman
Bethany, Mo.	Crow	B. P. Sigler
Binghamton, N. Y.	Oakland	Binghamton M. C. Co.
Bloomingdale, O.	Crow	Blackburn Bros.
Boscobel, Wis.	Crow	O. M. Mathison
Bradford, N. H.	Jeffery	F. H. Messer
Bridgetown, N. J.	Oakland	J. R. Elwell
Brocton, N. Y.	Oakland	Lawrence Ryckman
Brooklyn, N. Y.	Moon	Putnam M. C. Co.
Bryan, Tex.	Ford	Brazos Ford Co.
Buffalo, N. Y.	Stutz	F. Klepper.
Buffalo, N. Y.	Crow	G. Schuster Garage & Sales Co.
Bushnell, Ill.	Jeffery	Herring Bros.
Camden, N. J.	Republic	C. F. Knuth
Canton, Pa.	Oakland	Harry Bruce
Caribou, Me.	Jeffery	W. R. Smith
Chambersburg, Pa.	Oakland	J. D. Schall & Co.
Chesapeake City, Md.	Oakland	R. H. Rees
Chicago, Ill.	Jeffery	Centaur Motor Co.
Chilton, Wis.	Jeffery	Thompson & Steffes
Cincinnati, O.	Partin-Palmer	John Rempe & Co.
Cobleskill, N. Y.	Pullman	W. H. Fox
Coloma, Mich.	Crow	William Umphrey
Columbus, O.	Partin-Palmer	Partin-Palmer Columbus Co.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Columbus, O.	Ford	Jacob Renner
Columbus, O.	Hupmobile	Kaiser M. C. Co.
Columbus, O.	Maxwell	G. E. Thomas Co.
Columbus, O.	Premier	Edward Miller
Columbus, O.	Studebaker	H. L. Haight
Concordia, Kans.	Jeffery	Wilcox & Burnside
Corvallis, Ore.	Cole	Prather, Miller & Acorn.
Cresson, Pa.	Jeffery	Conrad Bros.
Crete, Ill.	Partin-Palmer	William Seggebruch.
Crisfield, Md.	Crow	L. S. Nock
Crown Point, Ind.	Partin-Palmer	Foss & Worsley.
Cynthiana, Ky.	Chevrolet	Cynthiana Carriage Co.
De Pere, Wis.	Partin-Palmer	De Pere Motor Car Co.
Des Moines, Ia.	Marion	Clamens Auto Co.
Des Moines, Ia.	Partin-Palmer	Partin-Palmer-Iowa Co.
Dover, Del.	Oakland	Dover Garage Co.
Elgin, Tex.	Jeffery	Rivers Bros. Merc. Co.
Elmira, N. Y.	Oakland	Elmira Ford Co.
Emporia, Kan.	Marion	I. C. Burkett.
Fairbury, Ill.	Crow	W. D. Spence
Forsythe, Mont.	Jeffery	Main Street Garage
Franklin, Pa.	Jeffery	Myers Carriage Co.
Fremont, Nebr.	Empire	S. A. Zapp
Fremont, Nebr.	Moon	A. Koyen
Ft. Dodge, Ia.	Jeffery	Hanson & Tyler Auto Co.
Galva, Ill.	Jeffery	Harris Bros.
Georgetown, Del.	Crow	T. R. Purnell
Green Bay, Wis.	Cadillac	Green Bay M. C. Co.
Green Bay, Wis.	Ford	Fox River Val. M. C. Co.
Gonzales, Tex.	Cole	Emil Schleyer.
Green Bay, Wis.	Maxwell	Lewis E. Conley Co.
Harney County, Ore.	Buick	A. K. Richardson
Havana, Cuba	Jeffery	Andres Diaz Pairo
Hemingford, Nebr.	Empire	Frank Caha
Herndon, Pa.	Oakland	Herndon Motor Co.
Hickory, Pa.	Moon	Ross M. C. Co.
Hilliards, O.	Ford	Leroy Dobyns
Houston, Tex.	Partin-Palmer	L. O. Brown.
Indianapolis, Ind.	Allen	Johnson & Zimmerman
Janesville, Wis.	Crow	J. A. Strimple
Joliet, Ill.	Jeffery	A. H. Gurney
Kankakee, Ill.	Jeffery	A. E. Cook
Kingston, N. Y.	Oakland	Jas. Millard & Sons Co.
Kittanning, Pa.	Moon	Moorhead M. C. Co.
Leaksville, Ill.	Partin-Palmer	I. L. Clayton.
Leedsdale, Pa.	Moon	F. G. Mohn
Lehighton, Pa.	Oakland	Lehighton M. C. Co.
Leipsic, O.	Jeffery	H. H. Townsend
Le Roy, N. Y.	Crow	Thomas Watson
Lima, O.	Jeffery	G. E. Wert
Lisbon, Ia.	Jeffery	N. A. York
Los Angeles, Cal.	Marion	Symonds Motor Car Co.
Los Angeles, Cal.	Partin-Palmer	Golden State Motor Car Co.
Louisville, Ky.	Paige	Reid Auto Co.
Lowell, Mass.	Jeffery	A. J. Cumiskey M. C. Co., Inc.
McKeesport, Pa.	Moon	J. T. Mooney & Son
Malvern, Ia.	Empire	C. B. Boles
Manchester, N. H.	Pullman	Firestone Garage
Manistee, Mich.	Jeffery	Auto Garage Co.
Mercer, Pa.	Moon	Mercer Auto Co.
Michigan City, Ind.	Cole	W. J. Geiger.
Milford, Del.	Oakland	W. I. Cirwither.
Milwaukee, Wis.	Metz	First Ave. Garage Co.
Milwaukee, Wis.	Jeffery	Reeke-Osmond M. C. Co.
Minneapolis, Minn.	Partin-Palmer	J. P. McGuire Regal Sales Co.
Minneapolis, Minn.	Crow	A. R. Curtis
Minneapolis, Minn.	Oakland	Choate Auto Repair Co.
Mitchell, S. D.	Partin-Palmer	Western Auto Co.
Mobile, Ala.	Partin-Palmer	Chas. R. G. Schimpf.
Monessen, Pa.	Moon	Monessen Plumbing & Electric Co.
Montreal, Can.	Partin-Palmer	Leger & St. Pierre.
Morris, Minn.	Jeffery	Alson, Hemming Auto Co.
Morristown, N. J.	Oakland	Harry Pew
Morristown, N. J.	Pullman	Borrean & Borrean.
Mt. Morris, Ill.	Partin-Palmer	Lewis Brinker.
Mt. Union, Pa.	Oakland	H. N. Bell
Mt. Vernon, O.	Jeffery	J. R. Clutter
Newhall, Ia.	Jeffery	Chas. Grovert & Son
Newton, Mass.	Oakland	Newton Garage & Auto Co.
New Hampton, Ia.	Crow	Leichtman M. C. Co.
New Haven, Conn.	Jeffery	D. E. Currie
No. Battleford, Sask, Can.	Cole	Lane Bros.
North Wales, Pa.	Oakland	R. M. Hallowell
Normal, Ill.	Partin-Palmer	Harris & Herr.
Norwich, N. Y.	Oakland	T. A. Jewell
N. Yakima, Wash.	Jeffery	Levi Z. Karr
Oconto, Wis.	Chalmers	Sophus Nelson
Olcott, N. Y.	Oakland	W. F. Kruger
Ontario, Can.	Partin-Palmer	Smith, Stecher & Feeder Co.
Orange, Cal.	Oakland	M. Eltiste & Co.
Oshkosh, Nebr.	Empire	Tucker Ross
Pass Christian, Miss.	Jeffery	Elmer Northrop & Co.
Pawnee, Ill.	Crow	Dyke Davis
Paximos, Pa.	Oakland	N. G. Adams
Philadelphia, Pa.	Mitchell	Fanning-Paxson Motor Co.
Plattsburgh, Mo.	Jeffery	C. R. Young Auto Co.
Pontiac, Mich.	Partin-Palmer	D. B. King.
Poplar Bluff, Mo.	Jeffery	E. C. Morrison
Portage, Wis.	Maxwell	Portage Boat & Engine Co.
Pottsdam, Pa.	Oakland	B. Paul Sheeder
Princeton, Ind.	Oakland	Steven's Auto Co.
Princeton, Ky.	Crow	Princeton Auto Supply Co.
Providence, R. I.	Stevens-Duryea	I. Edward Newton Co.
Quincy, Fla.	Crow	W. F. Lester
Red Lodge, Mont.	Jeffery	Draner Bros.
Rochester, N. Y.	Crow	G. W. Henner
Rockford, Ill.	Partin-Palmer	Lundstrom Bros.
Rockville, Conn.	Jeffery	Snow Garage Co
Rocky Mount, N. C.	Crow	Burnette & Chapman
Rome, N. Y.	Oakland	Sears Auto & Supply Co.
Roscoe, Minn.	Crow	Western Minn. Auto Co.
Rosedale, Tex.	Moon	B. Ashby
Salem, N. J.	Oakland	G. S. Smith
Salem, N. J.	Pullman	E. H. Davis
Salina, Kans.	Jeffery	Ollinger Auto Co.
Salisbury, Mo.	Jeffery	Stamper & Shannon
Salt Lake City, Utah	Chrevolet	J. P. Fowler Mfg. Co.
San Antonio, Tex.	Partin-Palmer	C. F. Tinnin.
San Francisco, Cal.	Jeffery	Jeffery Auto Sales Co.
Sanford, Fla.	Cole	A. D. Zachary.
Santa Rosa, Cal.	Regal	F. O. Renstrom Co.
Schenectady, N. Y.	Oakland	H. W. Chubb
Seattle, Wash.	KisselKar	Metropolitan M. C. Co.
Sheboygan, Wis.	Maxwell	W. A. Knaack Motor Co.
Sheffield, Ill.	Partin-Palmer	C. W. Gunkle.
Sheldon, Ill.	Crow	Chas. Bowen
Sherbrooke, Que.	Cole	Sherbrooke M. C. Co.
Smithville, O.	Crow	J. J. Schrock
Somersworth, N. H.	Jeffery	W. E. Fellows
Souderton, Pa.	Oakland	Souderton Garage
South Bend, Ind.	Crow	H. E. Cril
South Whitley, Ind.	Crow	W. Bowdy & Son
Spokane, Wash.	Hupmobile	C. Twitchell, B. B. & B. E. Schmidt
Springfield, Mass.	Pullman	Hampden Auto Co.
St. Claire, Mo.	Haynes	C. F. Neirheiser.
St. Louis, Mo.	Oldsmobile	Gratiot Cabanne
St. Louis, Mo.	Speedwell	Meyer Motor Co.
St. Louis, Mo.	Lyons-Knight	Brinkman Auto Co.
Sterling, Ill.	Partin-Palmer	E. S. Werneke.
Stetsonville, Wis.	Partin-Palmer	Erickson & Evenson.
Tacoma, Wash.	Ford	Universal M. C. Co.
Tacoma, Wash.	Maxwell	G. R. Green M. C. Co.
Tacoma, Wash.	King	G. R. Green M. C. Co.
Tamaqua, Pa.	Oakland	Seligman & Co.
Tampa, Fla.	Cole	West Coast Auto Co.
Terre Haute, Ind.	Jeffery	L. F. Hayes
Tiffin, Mo.	Crow	Zener Bros.
Toledo, O.	Pullman	Bacon Bros.
Toronto, Ont.	Jeffery	Standard Motors, Ltd.
Toulon, Ill.	Crow	F. E. Cole
Urbana, O.	Cole	Stanley Filler
Van, Pa.	Crow	G. E. Kelly
Velva, N. D.	Crow	Edward Gilbertson
Viola, Ill.	Crow	Frakes & Ashenhurst
Wahoo, Nebr.	Empire	Stallver Hanson
Waterloo, Ill.	Haynes	James Bennett.
Waterloo, Ill.	Metz	James Bennett.
Wausau, Wis.	Maxwell	W. R. Chillis.
Wellington, O.	Partin-Palmer	Baumgardner Bros.
Wenatchee, Wash.	Buick	W. T. Thornhill
West Frankfort, Ill.	Partin-Palmer	Smith & Blake.
Westerly, R. I.	Jeffery	H. C. Barber
Westfield, Wis.	Jeffery	Schauer Bros.
Weston, Mo.	Jeffery	Weston Auto Co.
Wilmington, Del.	Oakland	F. W. Ayers
Winthrop, Minn.	Crow	F. N. Nelson
Wood Lake, Minn.	Jeffery	W. O. Dillingham
Worcester, Mass.	Jeffery	F. S. Howard
Wyaconda, Mo.	Crow	Kerner Bros.

COMMERCIAL VEHICLES

Annona, Tex.	Chase	Blake Dellinger.
Ashland, Wis.	Chase	H. D. Ewer.
Cleburne, Tex.	Chase	Barnes & Adams.
Charlotte, N. C.	Chase	Chase Motor Truck Sales Co.
Coleman, Tex.	Chase	Gray & Martin.
Corsicana, Tex.	Chase	Hosser & Colquitt.
Crisfield, Md.	Chase	H. P. Ford Machine Co.
Decatur, Tex.	Chase	W. B. Man.
Denton, Tex.	Chase	Taylor Hardware Co.
Forney, Tex.	Chase	J. T. Dozier.
Grand Saline, Tex.	Chase	Grigers & Simpson.
Grapevine, Tex.	Chase	R. L. Lucas.
Great Falls, Mont.	Chase	E. L. Vinyard.
Greenville, S. C.	Chase	Bridges & Snow.
Greenville, Tex.	Chase	O. T. Engleman.
Jacksonville, Tex.	Chase	I. L. Newson.
Kingston, Jamaica	Chase	J. Sutton Brown.
Knoxville, Tenn.	Chase	E. W. Gillispie.
Koln am Rhine, Germany	Chase	Max. Harff.
Mart, Tex.	Chase	J. M. Booth.
McKinney, Tex.	Chase	C. J. Smith.
Meridian, Miss.	Chase	M. R. Adams.
Mineral Wells, Tex.	Chase	Peak & Loflin.
Montreal, Que.	Gramm	Legare Gadbois Auto Co.
Morristown, N. J.	Chase	C. L. Lade.
New London, Conn.	Chase	A. J. Philips.
Orlando, Fla.	Chase	I. B. Magruder.
Palmyra, N. J.	Republic	C. F. Knuth
Richardson, Tex.	Chase	W. E. Dean.
Springfield, Ill.	Chase	O. W. Halcher.
Stephensville, Tex.	Chase	C. R. Coulter.
St. Louis, Mo.	Brown	Meyer Motor Co.
St. Louis, Mo.	Diamond T	Meyer Motor Co.
St. Louis, Mo.	Chase	M. W. Bond Auto Co.
Sulphur Springs, Tex.	Chase	H. H. Alvord.
Tacoma, Wash.	Gramm	Gramm-Bernstein M. T. Co.
Tiffin, O.	Krebs	Miller & Summers
Vernon, Tex.	Chase	E. L. Ladd.
Waxahachie, Tex.	Chase	Pounds & Norsworthy.
Weatherford, Tex.	Chase	Quick Service Garage.
Whitewright, Tex.	Chase	Lloyd Moore.
Wichita Falls, Tex.	Chase	Jamison Hardware & Impl. Co.
Windom, Tex.	Chase	Claude Dowlen.
Wortham, Tex.	Chase	Sneed & Weidner.

Accessories for the Automobilist

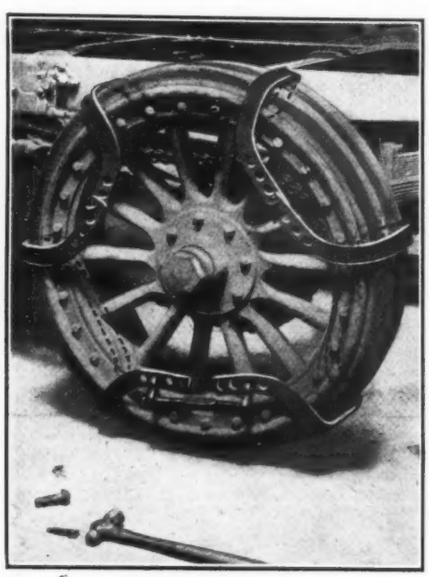
LYON Solid Tire Grips—A non-skid device that is designed especially for service on heavy motor trucks and which can be used with smooth or block, single or dual tread tires, is shown in Fig. 1. This device was formerly manufactured by the Lyon Grip Co., but is now being produced by the Weed Chain Tire Grip Co., New York City. The grip, which is made from flat stock, special alloy, oil-tempered spring steel, consists of three main units forming a hexagon. At the corners of this hexagon are the flat tread bands that run across the surface of the tire for securing better traction. These units are made adjustable to the wheel diameter by the series of holes shown. this feature is important because, unlike pneumatics, solid tires decrease considerably in diameter as they wear out. The grips must be kept tight, as play wears the pins and allows the wheel to spin inside the grip. But even when the grip is put on very tightly the natural elasticity of the side members is sufficient to permit the gradual shifting of the whole grip, thus distributing the wear on the tires. The outer surface of the tread is concave to give traction and the inner is rounded so that it will not sink into the tire. One noteworthy feature is that it is unnecessary to jack up the wheel to put the grip on. First, place one section squarely on top of the tire as shown in Fig. 1, then attach the other two members by inserting the pins in the proper holes and spreading the cotters. This done, attach the turnbuckle at the bottom and draw the ends of the grip as tightly together as possible, meanwhile pounding the grip into place with a hammer. Finally, insert and fasten the bottom to the bottom pin.

Handy Magnetic Lamp—Fig. 2 illustrates a trouble lamp that will stick to any iron or steel surface and stick so tightly that no ordinary blow will dislodge it, for in the base of the lamp there is an electro-magnet that exerts a pull of 13 pounds. The advantage of using one of these lamps, when working on the car at night, is that it is possible to place the lamp in just the position desired and yet have both hands free to work with. Light is supplied by a 4 candle power, 6 volt mazda lamp, which is regularly provided with an Ediswan base to keep the bulb from coming loose, although other bases may be had if desired. Current may be taken from a storage battery or dry cells, the lamp operating equally well from either. The device is made with a silver-plated reflector and is furnished in aluminum and nickel finish.

Cox Oxygen Carbon Cleaner—With this outfit it is claimed that carbon can be burned out of a four-cylinder engine in 30 minutes and a six in 45. The apparatus consists of an oxygen tank, pressure gauge, reducing valve, and rubber tubing with a brass nozzle and stop cock at the end that is inserted into the cylinder. This appliance is furnished complete by the Cox Brass Mfg. Co., Albany, N. Y., for $25. Empty oxygen tanks may be exchanged for full ones for $2. There is enough oxygen in one tank to clean thirty-five to forty cylinders.

Simplicity Curtain Openers—The difficulty of getting in or out of an automobile when the side curtains are buttoned down tight can be done away with by using the curtain opener shown in Fig. 3. It consists of a detachable metal brace which is put on the front end of the door and to which the side curtain is buttoned. At its rear, the curtain is attached to the top bows in the usual way. The curtain openers are adjustable to fit any car or top and can be put on by any top maker. When once fitted, they can be put in place in a few seconds by buttoning at A and B and screwing up on the clamp at C. A leather guard is furnished which prevents the strip of wood on the top of the door from becoming scratched. The Dayton Top and Improvement Co., Dayton O., is the maker of this device.

Horat Hammer Mold—A unique invention for remaking soft metal hammer heads comes from the machine shop of J. Horat, 827 Main St., Lafayette, Ind. It is well known that hammers of this type get out of shape or become hard in a very short time and it is to save the expense of replacing these hammers that this device has been put on the market. It is made up of two parts; the mold, which is barrel shaped, and the ladle, in which the metal is melted. The mold is split horizontally and is attached at one end to the ladle by a small passageway. At one side of the mold is a hole that allows the hammer handle to be inserted, thus becoming a unit with the head when the metal fills the mold. With this device, instead of throwing away a hammer when it becomes hardened or worn, a new one can be made by melting the head up in the ladle, sticking the handle into the side of the mold and casting a new head by turning the ladle up on its side and allowing the metal to run into the mold.



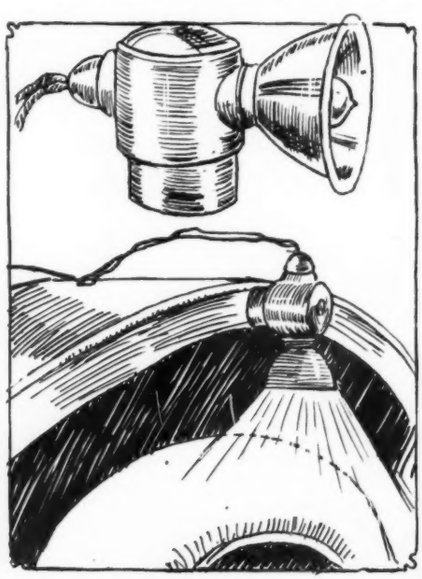


Fig. 1—At left, Lyon solid tire grips showing method of attaching the grip to the wheel. The ends are drawn together by a turnbuckle and then pinned in place

Fig. 2—Center, handy magnetic lamp. Lower view shows how lamp can be attached to the fender when it is necessary to repair a tire

Fig. 3—At right, simplicity curtain openers, illustrating method of attachment. The device is buttoned at A and B and is clamped at C

NEARLY ALL AUTOMOBILE AGENTS

ARE INSISTING ON THEIR CARS BEING EQUIPPED WITH

LBA

TRADE MARK REGISTERED

STORAGE BATTERIES

Can you wonder why, when you note the following list of manufacturers whose cars are already so equipped?

A

Abbott Motor Co., Detroit, Mich.
Adams-Lancia Co., New York City.
Allen Motor Car Co., Fostoria, Ohio.
Alpena Motor Car Co., Alpena, Mich.
American La France Fire Engine Co., Elmira, N. Y.
American Motors Co., Indianapolis, Ind.
Ames Motor Car Co., Owensboro, Ky.
Apperson Bros. Automobile Co., Kokomo, Ind.
O. Armleder Company, Cincinnati, Ohio.
Auburn Automobile Co., Auburn, Ind.
Austin Automobile Co., Grand Rapids, Mich.
Avery Company, The, Peoria, Ill.

B

Bartholomew Company, Peoria, Ill.
Benton Motor Car Co., Benton, Ill.
L. Berg Carriage Co., Dallas City, Ill.
Briggs Detroiter Co., Detroit, Mich.
Buckeye Manufacturing Co., Anderson, Ind.

C

Canadian Standard Auto & Tract. Co., Fort Wayne, Ind.
Cartercar Company, Pontiac, Mich.
J. I. Case T. M. Machine Works, Racine Junct., Wis.
Chadwick Engineering Works, Pottstown, Pa.
Chandler Motor Car Co., Cleveland, Ohio.
Chevrolet Motor Co., Flint, Mich.
Colby Motor Co., Mason City, Ia.
F. Coleman Carriage & Harness Co., Ilion, N. Y.
Commerce Motor Truck Co., Detroit, Mich.
Corbitt Automobile Co., Henderson, N. C.
Crane Motor Car Co., Bayonne, N. J.
Crawford Automobile Co., Hagerstown, Md.
Crescent Motor Company, Cincinnati, Ohio.
Crow Motor Car Co., Elkhart, Ind.
James Cunningham, Son & Co., Rochester, N. Y.

D

Geo. W. Davis Carriage Co., Richmond, Ind.
Di Dion Bouton, New York City.
Dorris Motor Car Co., St. Louis, Mo.

E

Enger Motor Car Co., Cincinnati, Ohio.
Elkhart Carriage & Harness Co., Elkhart, Ind.

F

F. A. L. Motor Car Co., Chicago, Ill.
F.I.A.T. Company, Poughkeepsie, N. Y.
Flanders Motor Co., Detroit, Mich.
H. H. Franklin Manufacturing Co., Syracuse, N. Y.

G

Gramm Bernstein Company, Lima, Ohio.
Gramm Motor Truck Co., Lima, Ohio.
Gramm Motor Truck Co., Walkerville, Ont.

H

Havers Motor Car Co., Port Huron, Mich.
Haynes Automobile Co., Kokomo, Ind.
Henderson Motor Car Co., Indianapolis, Ind.
Herreshoff Motor Co., Detroit, Mich.
Howard Motor Car Co., Connersville, Ind.
Hupp Motor Car Co., Detroit, Mich.

I

Imperial Automobile Co., Jackson, Mich.

J

Jackson Motor Car Co., Jackson, Mich.

K

Kelly-Springfield Motor Truck Co., Springfield, O.
King Motor Car Co., Detroit, Mich.
Kissel Motor Car Co., Hartford, Wis.
Kline Motor Car Co., Richmond, Va.
Knox Automobile Co., Springfield, Mass.
Krit Motor Car Co., Detroit, Mich.

L

Lancia Company, Turin, Italy.
Lenox Motor Car Co., Boston, Mass.
Lexington Motor Car Co., Connersville, Ind.
Locomobile Co. of America, Bridgeport, Conn.
Lozier Motor Car Company, Detroit, Mich.
Lyons Atlas Company, Indianapolis, Ind.

M

W. H. McIntyre Company, Auburn, Ind.
McLaughlin Motor Car Co., Oshawa, Ont.
Marathon Motor Co., Nashville, Tenn.
Marion Motor Car Co., Indianapolis, Ind.
Maritime Motor Car Co., Ltd., St. John, N. B.
Martin Carriage Works, York, Pa.
Martindale & Millikan, Franklin, Ind.
Mason Motor Car Co., Waterloo, Ia.
Maxwell Motor Car Co., Dayton, Ohio.
Mercer Automobile Co., Trenton, N. J.
Meteor Motor Car Co., Shelbyville, Ind.
Metzger Motor Car Co., Detroit, Mich.
Mitchell-Lewis Motor Car Co., Racine, Wis.
Moline Automobile Co., East Moline, Ill.
Motor Car Manufacturing Co., Indianapolis, Ind.

N

Nance Motor Car Co., Philadelphia, Pa.
National Motor Vehicle Co., Indianapolis, Ind.
Nordyke & Marmon Co., Indianapolis, Ind.
Norwalk Motor Car Co., Martinsburg, W. Va.
Nova Scotia Carriage Co., Kentville, N. S.
Nyberg Automobile Works, Anderson, Ind.

P

Packard Motor Car Co., Detroit, Mich.
Paige-Detroit Motor Car Co., Detroit, Mich.
Palmer & Singer Manufacturing Co., Long Island City, N. Y.
Paterson Wagon Works, Flint, Mich.
Peerless Motor Car Co., Cleveland, Ohio.
Pilot Motor Car Co., Richmond, Ind.
Pope Manufacturing Co., Hartford, Conn.
Premier Motor Car Co., Indianapolis, Ind.
Pullman Motor Car Co., York, Pa.

R

Regal Motor Car Co., Detroit, Mich.
Renault-Frerers Selling Co., New York City.
Reo Motor Car Co., Lansing, Mich.
Reo Motor Car Co. of Canada, St. Catharines, Ont.
Russell Motor Car Co., West Toronto, Ont.

S

Sayers & Scovill Co., Cincinnati, Ohio.
Seagrave Company, Columbus, Ohio.
Selden Motor Car Co., Rochester, N. Y.
Simplex Automobile Co., New Brunswick, N. J.
A. O. Smith Company, Milwaukee, Wis.
South Bend Motor Car Works, South Bend, Ind.
Spaulding Manufacturing Co., Grinnell, Iowa.
Speedwell Motor Car Co., Dayton, Ohio.
Stafford Motor Car Co., Kansas City, Mo.
Stanley Motor Car Co., Newton, Mass.
Stayer Carriage Co., Chicago, Ill.
F. B. Stearns Co., Cleveland, Ohio.
Stegeman Motor Car Co., Milwaukee, Wis.
Sternberg Manufacturing Co., Milwaukee, Wis.
Stevens Duryea Co., Chicopee Falls, Mass.
Stoddard Dayton Co. (Maxwell), Dayton, Mich.
Studebaker Corporation, Detroit, Mich.
Stutz Motor Car Co., Indianapolis, Ind.

U

U. S. Carriage Co., Columbus, O.

V

Vandewater & Company, Elizabeth, N. J.
Velie Motor Vehicle Co., Moline, Ill.

W

Wayne Works, Richmond, Ind.
Webb Company, Allentown, Pa.
Westcott Motor Car Co., Richmond, Ind.
Wichita Falls Motor Co., Wichita Falls, Tex.
Willys Overland Co., Toledo, Ohio.
Winton Motor Car Co., Cleveland, Ohio.

Z

Zimmermann Manufacturing Co., Auburn, Ind.

Like the man who sticks to his straw hat in the winter, the agents for the very few cars not equipped with LBA Batteries feel "queer."

Car buyers want to know why an imitation battery is included in their equipment when the LBA is installed in the great majority of cars.

The appearance of the storage battery matters little; it's the insides that count, and customers know the LBA quality is found only in the battery with "LBA insides."

Users of the LBA are insured satisfaction by the LBA organization—a great, up-to-date factory—5 Company-owned Branches and 150 REAL SERVICE STATIONS distributed throughout the country to look after your needs.

Write us for full information

WILLARD STORAGE BATTERY COMPANY

CLEVELAND, OHIO

NEW YORK BRANCH: 136 West 52nd Street
DETROIT BRANCH: 1191 Woodward Avenue
CHICAGO BRANCH: 2241 Michigan Avenue
SAN FRANCISCO BRANCH: 243 Monadnock Bldg.
INDIANAPOLIS BRANCH: 438 and 439 Indiana Pythian Bldg.

(73)

Wagner Current Rectifier—Operating from an ordinary 110-volt alternating current lighting circuit, the Wagner rectifier, brought out by the Wagner Electric Mfg. Co., St. Louis, Mo., permits of home charging of batteries. The device is compact, simple and automatic in its action and consists of an electromagnet with a flat-spring armature held rigidly at on end. The other end is free to vibrate against the core of the magnet. The connections are such that the armature is attracted once for every cycle of the alternating line current. At each attraction a contact is made which allows part of the alternating current wave to go through the battery. At the instant the battery voltage equals the voltage of the wave the armature is released, thus preventing the battery from discharging by allowing the reverse wave to flow through. The Wagner rectifier is illustrated in Fig. 4 and is supplied with lamp cord and plug for attachment to the lamp socket. The maker states that even if the supply current fails, no harm is done as the armature remains in the open position and as soon as the current is again flowing the rectifier begins to operate automatically.

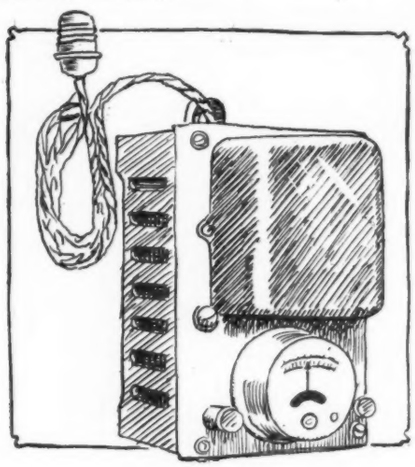


Fig. 4—Wagner alternating current rectifier for transforming alternating current into direct for charging storage batteries at home

Universal Steel Wheel—A steel wheel, Fig. 5, radical in design yet of pleasing appearance, has been announced. Its special feature is the pressed steel web or disk connecting the hub to the rim, and taking the place of the customary spokes. Although this wheel is a new construction, it has a very conventional appearance, probably because the radial depressions in the web give a suggestion of spokes. Lightness, cheapness, durability, and strength are the advantages claimed for this wheel. It is also easier to clean.

The disk is a very interesting piece of work because while it is rather complicated in form it is pressed from a sheet of steel without straining or drawing the metal in the least. This is accomplished by making the radial grooves one by one. But before this is done, the hub center and six small holes around it are stamped out. These holes serve to center the work in the machine and are later used to slip the bolts through that hold the halves of the hub casing together. The method of pressing the spoke-like grooves singly was finally adopted because it was found impossible to do this work in one operation without weakening the metal by drawing it.

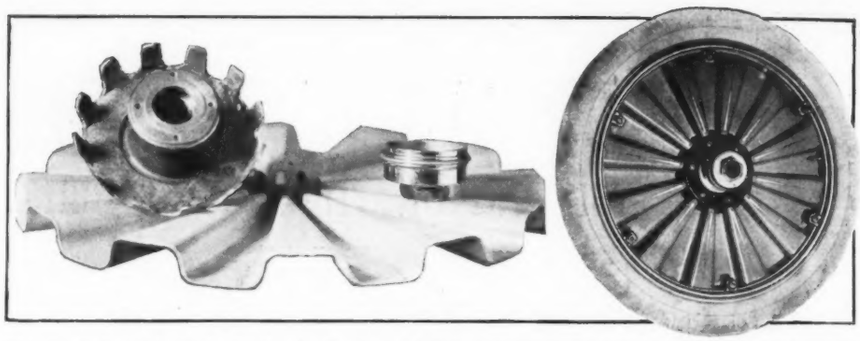


Fig. 5—Universal steel wheel. Left, view of disk and pressed steel hub casing; right, view of wheel assembled

The hub consists of two parts; the inner one taking the load and the outer one acting as a casing. The former is cast on the disk and is then bored out to receive the bearings. The casing is made of two steel stampings that are formed to fit the wheel and are held together by six bolts.

Attaching the rim to the web is done by spot welding or riveting.

For passenger cars and light trucks only one disk is used but when very heavy wheel loads are to be carried two disks are employed.

M. & M. Laplock Tire—This tire, Fig. 6, differs from the ordinary type in that its base is so constructed that one edge laps over the other, thus forming an almost cylindrical chamber for the tube. It is claimed that this feature prevents pinching of the tube, gives an equal distribution of pressure throughout the casing, locks the tire more firmly to the rim thus doing away with the necessity of using lugs, eliminates the inner flap, and that it is easier to remove or replace a tube with this construction. The maker is the Morgan & Marshall Rubber and Tire Co., East Liverpool, O.

Temco Drill—A handy electric drill, the product of the Temco Electric Motor Co., Leipsic, O., is illustrated in Fig. 7. It is started and stopped by the simple twist of a button and is readily handled because its weight is only 11 pounds and its length 15 inches. Besides the ordinary operations of drilling and tapping the machine can be used for valve grinding by applying a special attachment. Arrangements have also been made for attaching a small emery wheel as shown in the illustration.

Perfection Battery Connectors—The Fitzgerald Mfg. Co., Torrington, Conn., is turning out the battery connectors shown at A and B, Fig. 8. At A is illustrated the Perfection spring battery connector which does not require nuts to hold it on the binding posts, although they may be used if desired. The Spring Lock battery connector is shown at B. The locking action is obtained by grooved terminals made from hardened copper and which have sufficient springiness to lock the thumb nuts holding them in place so that they will not jar loose. The former is priced at 35 cents a dozen and the latter sells for 15.

Globe Garage Hose—A hose for which great durability is claimed bears the name of the United & Globe Mfg. Co., Trenton, N. J. The hose is a rubber tubing of ordinary design outside of which is woven a flexible steel armor that almost completely covers the rubber underneath. The armor is made of flat wire which is woven into a fabric that resembles lattice work in its structure, thus providing the necessary flexibility.

Hauck Kerosene Torches—These torches are claimed to equal in performance the best gasoline torches, yet have the advantage of being safer and cheaper to operate. Hauck torches do not differ in appearance from the types now in use. Features worthy of notice are that the tank will not become warm, no matter how long the burner is operated and a pressure of 1 pound is all that is required for running. A full line of torches is made although numbers 14, 15 and 7 are especially recommended for garage use. On account of its size number 7 has its burner separate from the tank, to which it is attached by a rubber hose. General specifications of these three torches are given below:

No.	Capacity	Oil per hour	Price Complete
14	½ Gal.	½ Pint	$15
15	1 "	2 "	20
7	10 "	1 Gal.	65

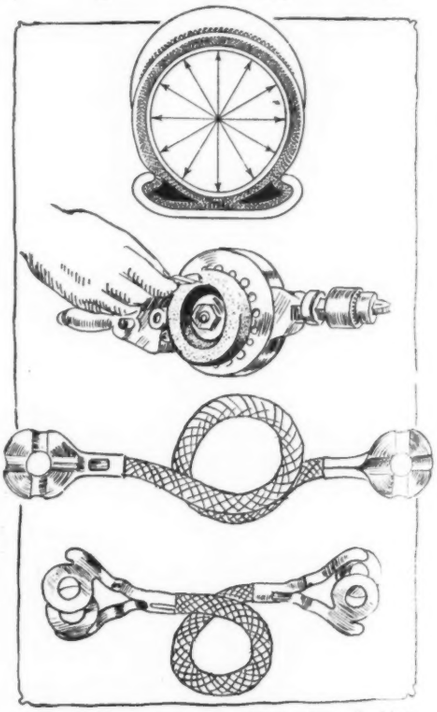


Fig. 6—Top, M & M Laplock tire, showing circular shape of tube and peculiar construction of lap

Fig. 7—Upper middle, Temco electric drill with emery wheel attachment

Fig. 8 (A)—Lower middle, spring lock battery connector

Fig 8 (B)—Bottom, perfection battery connectors